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Editorials

TEACHING FENESTRATION SURGERY*

FROM 1938 to 1948 about 500 of our best otologists from every part of the country and a few from other lands attempted to learn the fenestration operation. Less than 100 of these men who took the prescribed course are now doing fenestration surgery adequately. The purpose of this article is to indicate one of the important reasons for the failure of many to continue to do fenestration surgery after completing the prescribed course in spite of the financial sacrifice involved in training (cost of transportation, loss of income from practice, tuition fee, instruments and living expenses estimated at about five to ten thousand dollars.)

During the six-week course the student watches experts perform about forty fenestration operations on the living. At the same time each student performs about fifteen operations on the cadaver. Both teacher and student assume that the conclusion of the six-week course will find each student equipped to perform this most difficult of all surgical procedures. The facts invalidate this assumption.

Why does this misevaluation persist? In the earliest days of the fenestration operation the teacher must have predicted that just such a six-week course would train each student to perform the operation on the living adequately. The student expected and hoped that this prediction would be accurate. However, too many men found at the end of the course that their individual performance on patients was not sufficiently successful for them to continue in this work. Since the performance of these surgeons was not up to their expectations, they believed the entire reason for their failure lay within themselves—that unless they could perform the operation with absolute success they were "absolute" failures. They therefore ceased doing the operation. Thus for years a mutual misevaluation of the course by both teacher and student ensued which has perpetuated much trained incapacity.

Actually there are only degrees of success in performance. The degree of skill acquired in this operation is in direct proportion to the degree of practice on the cadaver. This would apply to learning almost any technical skill. Therefore, the six-week course should be regarded as the first phase of learning the fenestration operation, to be followed with repetitive cadaver operations until expert skill has been achieved. If this simple truth had been applied, almost every one of the 400 non-performing otologists would now be doing fenestration surgery. This is not to imply that adequate cadaver practice would result in equal skill for all, but it would result in more adequate performance. At the end of the six-week course the basic evaluation of the student should not be, "I am a failure because I cannot perform the operation with absolute success," but rather, "Further practice on the cadaver will develop my skill to that of an expert." One must repeat over and over this complicated technic

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on all sorts of variable anatomic specimens so that final performance will be highly skilful and fluent.[1]

As the student watches the expert operate with ease and smoothness, he observes perfection; but seldom does the student benefit by witnessing errors in technic, even on the cadaver. Too little of the dangers of the operation are demonstrated. Errors as well as perfect technic should be thoroughly learned on the cadaver.

Students doing cadaver work in a class unwittingly compete with each other. When a student makes a vital technical blunder which others in the class avoided, he tends to make a poor evaluation of himself, with resulting tension. This tension increases the tendency to blunder. It is recommended, therefore, that after completing the course the student perform the rest of his cadaver operations alone and in silence. In such a relaxing atmosphere learning becomes amazingly rapid.

The formal course in fenestration surgery should explicitly denote that at the end of six weeks the student is, as a rule, not yet ready for the operating room but must continue the cadaver work at his leisure until he becomes expert. A well trained otologist wishing to learn this operation need not necessarily take a formal course provided he can observe expert surgeons operate and then perform about 100 cadaver operations himself.

The principle of practice makes perfect is simple and some will feel offended that such an obvious principle should be so stressed. Yet objective analysis would indicate that no matter how much this simple principle is approved verbally, in most cases it is not fully applied in practice.

The six-week course of fenestration surgery is excellent as a beginning. The completion of the course should then become the signal for much more cadaver practice until perfection is achieved. Most of the surgeons who discontinued the fenestration operation could and should rehabilitate themselves by resuming cadaver practice.

SAMUEL ROSEN, M.D.

[1] ROSEN, SAMUEL. Learning the Lempert fenestration operation. *Arch. Otolaryng.*, 45: 335–338, 1947.

PROPER USE OF Rh NEGATIVE BLOOD

SINCE the discovery of the Rh factor and its role in the etiology of erythroblastosis fetalis and hemolytic transfusion reactions, the necessity for transfusions to be Rh compatible as well as group compatible has been duly recognized and emphasized. It is particularly important that Rh negative individuals receive only Rh negative blood. Because of this some misuses of Rh negative blood have arisen. In many instances when the Rh type is unknown Rh negative blood will be used although no emergency exists.

Following the advent of the modern blood bank and the great increase in the incidence of transfusions many clinicians seemed to think that the supply of blood, including the Rh negative type, is unlimited. It must be remembered that only 13 per cent of the population of the United States are Rh negative; hence only 13 per cent of random donor blood will be Rh negative. When it is considered that Rh negative blood must be used in the therapy of erythroblastosis fetalis despite the infant being Rh positive and that group O Rh negative blood is used as universal donor blood in emergencies when the blood factors are unknown, it is evident that the demand for Rh negative blood actually exceeds the supply. This extra need may be met by volunteer panels of Rh negative donors or by paying professional donors of this type. This plan may not be practical or feasible in all hospitals. A proper approach to this problem would be the preliminary blood grouping and Rh typing of all hospital admissions, the restriction of Rh negative transfusions to Rh negative recipients and cases of erythroblastosis fetalis, and the use of Rh negative blood as universal donor blood only when the Rh type is unknown and a true emergency exists.

LESLIE HUGHES TISDALL, M.D.

Original Articles

TUMOR OF THE MAJOR DUODENAL PAPILLA*

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THIS communication presents three cases of biliary obstruction limited to the major duodenal papilla with essentially similar clinical symptomatology. A pathologic diagnosis of carcinoma was made in each case but subsequent study of the tissues in one of the cases showed the diagnosis to be incorrect and stimulated us to undertake a pathologic study of the major duodenal papilla. The results of this study emphasized the difficulty of the pathologic diagnosis of cancer in this region and resulted in the revision of the original diagnosis of cancer in one of the cases. It is this possibility of diagnostic error and its influence on the surgical therapy which is the basis for the following communication.

Improved surgical technic and a better understanding of the surgical physiology of the duodenum and pancreas have attracted new attention to the problems which confront the surgeon in this region. Justification for the radical attack upon carcinoma of the pancreas is seen in the light of such knowledge and achievement. Primary tumors of the major papilla, however, continue to resist efforts of surgeons and internists to evolve reasonably satisfactory diagnostic and therapeutic procedures. The smallness of such lesions, together with the frequent absence of ulceration, tends to confound the surgeon even though the duodenum is opened and direct inspection permitted. The pathologist's task is not any easier for when the tissue is examined microscopically, malignant and non-malignant changes may be extremely difficult to differentiate.

Baggenstoss[1] in a study of the autopsy material from the Mayo Clinic up to October 1, 1936, found twenty-five cases of polyp of the major duodenal papilla and twenty-eight cases of primary carcinoma, an observation which emphasizes the comparative frequency of benign lesions. Christopher[2] in 1933 called attention to nonmalignant tumors of the ampulla and the diagnostic challenge which they present. Grove and Rasmussen[3] reported the successful removal of a tumor that in the pathologic study was benign but the patient died two years later of apparent metastatic carcinoma (no autopsy was performed). Horsley's[4] successful pancreatoduodenal resection of a tumor of the papilla thought to be malignant but which subsequently proved to be nonmalignant again emphasizes recognition of the difficulty encountered in making the correct pathologic diagnosis.

The treatment of proven tumors affecting the major duodenal papilla is no less a challenge than the accurate diagnosis. Gray and Sharpe[5] reported eight transduodenal excisions of lesions of the papilla at the Mayo Clinic with a mortality of 37.5 per cent and survival periods varying from two to thirty-five months for those

* From the Divisions of Surgery and Pathology of the Santa Barbara Cottage Hospital and the Department of Pathology of the University of Southern California. Read at the nineteenth annual meeting of the Pacific Coast Surgical Association in Los Angeles, February 26, 1948.

patients who survived surgery. One patient on whom a modified Whipple operation was performed failed to survive the operation. Dennis and Varco[6] in an analysis of the University of Minnesota series submitted five cases subjected to local resection with no operative mortality and with four patients living and well for periods of nine to thirty-six months. One patient died after ten months. Their three radical excisions were likewise accomplished without surgical mortality and with two survivors living and well at one and two months, respectively, while the third died after eight months. Cattell[7] operated upon twelve patients with carcinoma of the ampulla and found evidence of metastases in the regional lymph nodes in only one case. However, he elected radical pancreatoduodenectomy for all cases. This is in accord with Baggenstoss'[1] report of metastases in but thirteen of twenty-eight cases of carcinoma of the major papilla. Orr[8] was less impressed with the assumption that such tumors are late in metastasizing, stating that five of his eight patients had eventually died of metastases although all had received radical surgery. In the three cases reported here no evidence of local invasion or of metastases was present. Such evidence is hardly consistent with the recommendation that the pancreatic head and a considerable portion of the duodenum be excised with the tumor. Is the present concept of radical pancreatoduodenectomy for lesions of the papilla a radical attack on the cancer or a radical attack on the patient's anatomy?

CASE REPORTS

CASE 1. This case involves resection of the head of the pancreas and duodenum following biopsy diagnosis of carcinoma that was subsequently shown to be incorrect. Acute inflammation of the major duodenal papilla (acute papillitis) was the cause for the obstruction of the biliary tract.

P. S., a white woman age thirty-eight, was admitted to the Santa Barbara Cottage Hospital on March 28, 1947, complaining of repeated attacks of severe, colicky upper abdominal pain, anorexia, nausea and vomiting, with intermittent slight jaundice for the past year.

Her past history was not remarkable with the exception of the cholecystectomy four years previously for cholecystitis and cholelithiasis.

Physical examination on admission revealed a well developed, dehydrated and jaundiced white woman. Her blood pressure was 70 systolic and 40 diastolic. The rectal temperature was 106°F. The only positive findings were the icteric tint to the skin, marked dehydration and an enlarged liver palpable 4 cm. below the right costal margin.

Laboratory studies were as follows, namely, the red blood cell count was 4.34 million with 14.5 gm. of hemoglobin; the white blood count was 27,000 and the differential showed eighty segmented neutrophils, thirteen stabs, four lymphocytes and one unidentifiable cell.

After three days of supportive treatment the patient had recovered sufficiently to permit an exploratory laparotomy. The preoperative diagnoses were stone in the common bile duct, advanced hepatitis and/or acute pancreatitis.

At operation a greatly distended common duct was found. A cholangiogram was taken which revealed that the hepatic radicles were well filled proximally. There was no visualization of the ampullary region. The duct was opened and no calculi were found. The duodenum was opened and the major duodenal papilla was noted to be enlarged. Following a biopsy taken from the enlarged papilla the duodenum and common duct were closed after two catheters had been placed in the common duct. One catheter was directed toward the liver and the other was passed into the duodenum through the papilla.

The diagnosis made from the pathologic study of the tissue removed was "well differentiated adenocarcinoma of the duodenal papilla." Because in the opinion of the pathologist there was some question as to the malignant character of the epithelial cells observed in the section, the slides were sent to another pathologist for consultation. The original opinion was confirmed by the consulting pathologist.

Fourteen days later a Cole modification of the Whipple operation was performed; the pancreatic stump was not implanted into the bowel. Pathologic study of the operative specimen disclosed the same type of pathologic

change as was observed in the biopsy material. A detailed study was made of the specimen. The results of this study and the study of other duodenal papillas demonstrated that the epithelial elements regarded as "well differentiated adenocarcinoma" in the biopsy were not neoplastic but small accessory pancreatic ducts cut in cross section. The details and results of these studies are recorded in the section on pathologic study.

The postoperative course was uneventful and the patient left the hospital on the seventeenth postoperative or hospital day.

The patient was last seen eleven months later at which time she stated that she felt fine, had gained weight and was able to pursue her usual activities. Laboratory findings at this time were all within normal limits.

Case II. This case involves a non-ulcerating papillary carcinoma of the duodenal papilla causing obstruction to the biliary tract that was not identifiable by direct inspection by the surgeon and attending pathologist at the time of operation.

A white man aged sixty-six entered the Santa Barbara Cottage Hospital complaining of intermittent attacks of severe pain in the epigastrium and right upper abdominal quadrant for the past six weeks. His first attack was initiated with a sudden chill. With each subsequent attack there was associated chilliness and temperature elevations to 103°F. The pain frequently radiated to the back and occasionally was accompanied by nausea. His appetite was poor and fatty foods were not well tolerated. He had lost 25 pounds in weight. There had been no pronounced jaundice but the scleras had been noticeably icteric. His past history was not contributory except that fifteen years before he had been hospitalized for a prepyloric ulcer.

Physical examination revealed a well developed elderly man who did not appear acutely ill. His skin and scleras were questionably icteric. The chest was essentially negative. Blood pressure was 140 mm. systolic and 90 mm. diastolic. The abdomen was tender to palpation in the right upper quadrant and mid-epigastrium. No masses were palpated and there was no involuntary muscle guarding. The liver was enlarged to percussion.

The significant laboratory findings were as follows, namely, red blood cell count was 4.6 million with 12 gm. of hemoglobin, and white blood cell count was 5,600. The only significant finding in the urinalysis was 1 plus bile; the icteric index was 16 and the blood amylase 517 units. A trace of occult blood was reported in the stool. The Kline and Kolmer serologic tests for syphilis were negative as well as agglutination tests for brucella, typhoid, paratyphoid A and B and proteus OX19.

Roentgenologic studies revealed a nodular pancreatic enlargement distorted the stomach but the emptying time of the stomach was not delayed. There was indentation of the greater curvature in the prepyloric zone and a small diverticulum of the descending duodenum. The gallbladder did not fill with dye and no opacities were visualized.

At operation the gallbladder was found to be distended to approximately twice its normal size and the common bile duct was markedly dilated. Moderate enlargement of the head of the pancreas was noted but it was concluded that the swelling was not characteristic of malignancy. No stones were palpated in the gallbladder or common duct nor was there manifest evidence of metastatic cancer. The common duct was opened but a probe met with obstruction at the approximate level of the duodenal papilla. The second part of the duodenum was opened through an anterior incision and the papilla identified as a mass protruding into the lumen of the duodenum; the mass was noticeably firm. Although the papilla was carefully inspected by the surgeon and the hospital pathologist, who was called to the operating room, it was concluded from the gross examination that no tumor was present. A diagnosis was made of inflammatory stricture and a probe was passed through the ampullary opening from the duodenal side. The duodenum was closed, a T-tube sutured into the common duct for external drainage and a biopsy taken of the pancreas. The pathologic study of the tissue removed disclosed no tumor.

The postoperative course was stormy and the patient died on the twenty-fifth postoperative day. Autopsy studies revealed a small nonulcerated papillary carcinoma of the papilla, without metastases. The tumor had not extended through the mucosa but was without question the cause of the obstruction to the biliary tract. (Fig. 8.)

Case III. This case involves a well differential adenocarcinoma of the major duodenal

papilla successfully treated with transduodenal excision.

A white man age sixty, was seen at the Santa Barbara Clinic in August, 1947, complaining of epigastric pain, vomiting, constipation and intermittent jaundice associated with chills and fever. History of the present illness revealed his first attack of pain, jaundice and vomiting occurred in June, 1946, while he was residing in the East. A diagnosis of infectious hepatitis was made at that time. Subsequently, there were repeated similar attacks in which the same diagnosis was made. Roentgenographic examinations in January, 1947, at the Mayo Clinic after a severe recurrence of epigastric pain and vomiting revealed a non-filling gallbladder and a duodenal ulcer.

Physical examination when the patient was first seen in Santa Barbara was essentially normal with the exception that the edge of the liver was palpable 3 cm. below the costal margin and that there was an icteric tint to the skin and scleras.

Laboratory examination revealed 10,500 white blood cells and 4.12 million red blood cells with 12.3 gm. hemoglobin. Urinalysis at first was negative but later positive for bilirubin, stool positive for both gross and occult blood, sedimentation rate 87 mm. in one hour, icterus index 31 units, bromsulfalein 50 per cent retention at the end of twenty minutes, cephalin-cholesterol flocculation negative and Van den Bergh's indirect 106, direct 2.8.

A diagnosis was made of obstruction of the common bile duct, probably an ampullary tumor or stricture. Operation was recommended but refused. The patient returned to his home in St. Louis, Missouri, where in October, 1947, he was operated upon. A personal communication from[9] the attending surgeon revealed that a tumor 1 cm. in diameter was found to involve the duodenal papilla. This was excised transduodenally, the common bile duct reimplanted into the duodenum and a gastrojejunosotomy performed. The patient made an uneventful recovery. The pathologic study of the specimen disclosed a well differentiated adenocarcinoma replacing the major duodenal papilla without evidence of metastases.

DIAGNOSIS

Perhaps in no surgical lesion is accuracy in diagnosis of more importance to the ultimate welfare of the patient than in tumors involving the papilla of Vater. It seems somewhat ironic when one reviews carefully the surgical literature to find the diagnosis rarely made correctly before operation or necropsy, especially when it is realized that a small lesion gives rise to symptoms so early. As pointed out by Sharpe and Comfort[10] the anatomic arrangement in the region of the papilla leads naturally to obstruction to the common bile duct and pancreatic ducts. Yet, in a series of forty cases which they reviewed at the Mayo Clinic carcinoma, or tumor, was suspected in only one prior to operation. This experience appears to be so universal that the frequency of diagnostic error should hardly be the object of criticism but should serve rather as a stimulus to further investigation of the lesion in the hope of uncovering such hidden characteristics as will point definitely to the condition. Somewhat later in this discussion an attempt will be made to show that accurate localization should play a more important role in the subsequent therapy.

There has been considerable difference of opinion as to whether the jaundice accompanying these tumors is constant or intermittent in nature. However, an analysis of several of the larger series of cases published suggests that at least in the early stage the greater number of patients will show intermittent jaundice. This has led several observers to the conclusion that a mildly fluctuating, slowly progressing jaundice which is of less intensity than that usually seen in cancer of the pancreatic head should strongly suggest a lesion of the duodenal papilla. The duration of this symptom is also worthy of note. Sharpe and Comfort[10] reported one in their series which showed an intermittent type of jaundice for a period of twenty-four months without any accompanying symptoms. One of our patients had this symptom for fourteen months, the second intermittently for eight months and the third for five weeks.

Pain may be expected to occur during some stage of the disease in over half of

these patients. It may vary markedly in character from a sharp colic to a very mild continuous discomfort. Chills and fever are probably to be expected more frequently in tumor of the papilla than earlier observation suggests. In the more recent literature the incidence appears as high as 50 per cent. All three of our patients presented this as a prominent symptom. Coincidental calculi may be a contributing factor in a certain few cases. In most patients with tumor of the papilla, nausea, with or without vomiting, may occur some time during the course of the disease. It is often related to the attacks of pain, particularly if the pain is colicky in nature. However, nausea may be present without pain. Diarrhea is a frequent complaint and steatorrhea may be noted on occasion. Inquiry into the nature of the stools and patient's bowel habits usually reveals no characteristic finding. Acholic stools usually associated with dark urine are common but these are inconstant. When there is ulceration and bleeding from the tumor, tarry stools may be seen and the presence of otherwise unexplained occult blood in the stool is a finding frequent enough to arouse suspicion of a lesion of the papilla. Loss of appetite and loss of weight are also of importance.

It has been well established that there is no characteristic clinical syndrome in tumor of the papilla whether the lesion be malignant or benign. The various symptoms may appear singly or in such multiplicity of pattern as to be extremely confusing. The physical and laboratory findings are not always helpful in definitely localizing the lesion even though they may be suggestive. A distended gallbladder may be difficult to palpate because of obesity, inability of the patient to relax or a high degree of muscular development. It is conceded by most observers that the gallbladder is distended in nearly all cases of malignant tumor of the papilla. Roentgen studies may yield unreliable information. Of the blood examinations the bilirubin concentration, when repeated, will give some information as to the degree of fluctuation of the jaundice.

Studies of the duodenal contents obtained by intubation may be valuable. When bile is absent, it may be concluded that the jaundice is of the obstructive type. The finding of blood in the duodenal contents is of greater diagnostic significance than when found in the stool.

Despite the most careful evaluation of clinical and laboratory studies many of these patients must undergo an exploratory laparotomy with nothing more than obstructive jaundice as an indication. Moreover, the findings at operation may aid little in determining the exact character and location of the lesion. Obstruction at the papilla as shown by McGowan[11] almost invariably results in a chronic inflammatory process involving principally the pancreatic head and giving the frequently erroneous impression of tumor in this region. Biopsy of the pancreas itself not only invites such complications as postoperative hemorrhage or pancreatic fistula but will yield no information of value if the lesion is in the papilla and may give a false impression when the lesion actually involves the head of the pancreas because of failure to obtain a specimen of a deep-seated tumor. It is here that Kaijser's[12] studies of a series of cholangiograms made at operation appeals to us as meriting serious consideration when one has difficulty in determining the cause of common duct obstruction at operation. Kaijser believes he can differentiate carcinoma of the pancreatic head, stone in the common duct, stricture of the duct, pancreatitis and lesions of the papilla. He describes in minute detail the cholangiographic picture characteristic of each lesion. Our experience with cholangiograms is necessarily much too limited to venture an opinion and perhaps this is true of many other observers. We believe, nevertheless, that this important subject warrants a more careful study by the roentgenologist and surgeon.

The lack of facilities for securing a satisfactory roentgenogram undoubtedly is a

deterring factor in the more general use of cholangiography at the operating table. Some two years ago in an attempt to overcome this handicap in cases of obstructive jaundice, we developed a simple operating room technic for cholangiography which has given uniformly good results. The procedure is safe provided a trained anesthetist is in attendance. It consists simply of the control of the respiratory movements with curare thus obviating the necessity for high speed equipment. The opaque medium may be injected directly into the common duct with a syringe and needle or introduced through a catheter or T-tube. An ordinary portable x-ray unit will provide excellent visualization of the duct system. A Bucky diaphragm will give better detail but is not absolutely essential. This method has proved invaluable in our hands in ordinary obstructions of the common duct such as those due to calculi and we believe it may be of considerable value in studying obstructions due to tumor once it is determined that it produces a characteristic outline as Kaijser maintains.

An opening in the duodenum will provide direct inspection and palpation of the papilla together with the opportunity for obtaining tissue for pathologic study. It had always appeared to us a rational procedure whenever there was doubt as to the cause and exact location of obstruction to the common bile duct. The presence of a well defined lesion such as a papilloma or papillary carcinoma should be seen and palpated by this maneuver. This assumption originally led many, including ourselves, to suppose that it would furnish conclusive proof as to the nature of the obstruction, all other methods failing. However, the studies of the duodenal papilla reported here clearly show the difficulties that may be encountered.

A THERAPEUTIC CHALLENGE

It is now some twelve years since Whipple[13] and his associates introduced their operation of pancreatoduodenectomy for carcinoma of the pancreatic head. In the interim a voluminous literature attests the acclaim and reception which this procedure has enjoyed and, in addition, has furnished many modifications and refinements in technic, all directed toward the goal of greater operative safety as well as the restoration of more nearly normal anatomic and physiologic relations. Concurrently, a wealth of investigation to enrich our knowledge of the physiology of the pancreas and biliary tract has resulted. Since the same operation has been advocated for tumors of both the pancreatic head and the duodenal papilla, it would seem worth while to evaluate the present surgical therapy with particular reference to tumor of the papilla. Several writers have intimated that in any sizable series of cases a certain number of benign lesions of the papilla will necessarily be subjected to the radical procedure. It is this attitude which has raised the question as to the justification for the radical operation when the location of the tumor can be definitely established in the region of the papilla.

Although in the hands of the experienced surgeon the risk in the modified Whipple operation has been greatly reduced, it still must be considered a very hazardous procedure.

For several reasons life expectancy is difficult to predict but omitting all patients with carcinoma of the pancreatic head, which in nearly all instances to date have ultimately died of metastases, we have yet to see a proper evaluation of the life expectancy in those patients with carcinoma limited to the papilla or in the equally important group with benign lesions of this structure. The physiologic disturbances resulting from pancreatoduodenectomy appear definitely to limit the patient's life span; and when we consider that even malignant lesions of the duodenal papilla metastasize slowly, it is doubtful if the radical resection is warranted as frequently as now performed.

The pathologic study consisted of a gross and microscopic study of major

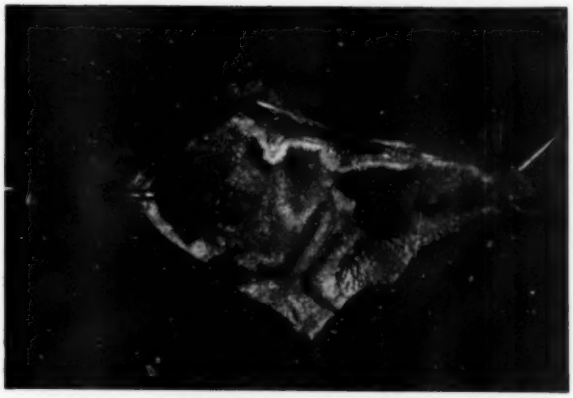

FIG. 1. Large papilla shown on the left that was 5 mm. high and 6 mm. at the base. Note the large opening of the common bile duct 8 mm. to the right without any elevation in the mucosa.

duodenal papillas removed from routine autopsies. The results although not yet complete are sufficiently documented to allow certain pertinent conclusions. The completed study will be the subject of a separate communication.[14] More than 100 major duodenal papillas have been examined microscopically and in certain instances with serial sections. Subsequently, the study was directed to the gross anatomic arrangement of the ducts and to date twenty-five specimens have been examined grossly with dissecting microscope and hand lens. Although several different types of openings were encountered, nearly all the specimens have shown a demonstrable papilla in the duodenum with the pancreatic and common bile ducts either entering separately through the papilla or joining at a point central to the muscular coat of the duodenum to form a united duct in the papilla with a single opening. These two types were noted in approximately equal numbers in the specimens examined. In one instance a true papilla was absent and each duct emptied separately into the lumen of the duodenum. Another specimen showed a well developed papilla through which entered the pancreatic duct; the common bile duct emptied 8 mm. away through a large opening without any elevation in the mucosa. (Fig. 1.) Diagrammatic representation of the principal types of arrangement of the ducts is shown. (Fig. 2.)

One of the most interesting revelations of this work was the demonstration of numerous small accessory pancreatic ducts in the duodenal papilla. When a large papilla is present, its greater bulk usually is composed of masses of small pancreatic

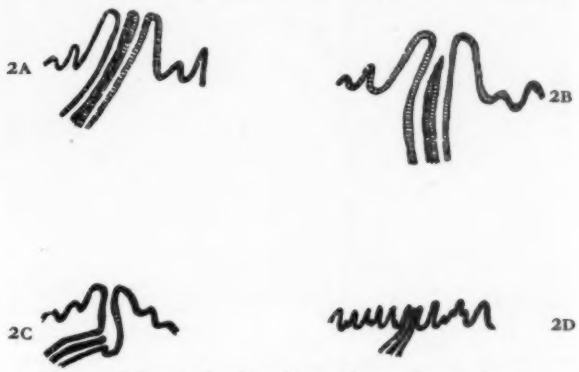

FIG. 2. Schematic drawings of openings of common bile and pancreatic ducts into duodenum. A, papilla with two separate openings; B, papilla with united ducts; C, papilla with ducts united and entering at an angle; D, ducts empty separately into the duodenum without the formation of a papilla.

ducts contained in connective tissue surrounding the united duct or the two ducts as the arrangement may be. These accessory pancreatic ducts were found to empty into the pancreatic duct, the common bile duct or where these ducts unite in the papilla. Frequently they emptied independently of the major ducts through the mucosa covering the papilla or in rare instances through the duodenal mucosa entirely independent of the papilla. (Fig. 3.) It was possible to trace their origin through the wall of the duodenum as packets of small ducts penetrating the smooth muscle of the wall at varying distances from the main duct. Their entry into the common bile duct before this duct passed through the wall of the duodenum was verified in several specimens. A specimen without accessory pancreatic ducts entering the main pancreatic and common bile ducts before their passage through the wall or from the wall to the papilla was extraordinarily rare. One such specimen is shown. (Fig. 4.) Small islands of pancreatic tissue were found between the muscle bundles in the wall of the

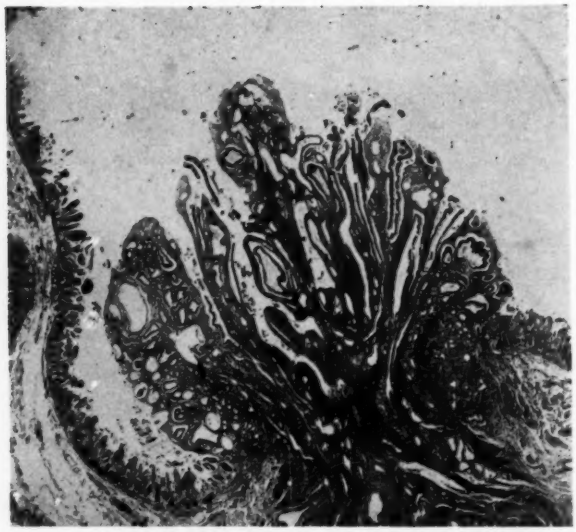

FIG. 3. A large well developed papilla with each duct emptying separately. Hyperplasia of epithelium (adenomatoid type) seen on the tip end of papilla on the septum separating the ducts. Numerous accessory pancreatic ducts empty on the lateral sides of the papilla. Phloxine methylene blue stain, × 30.

FIG. 4. A large papilla with the ducts united and forming a single channel; note complete absence of accessory pancreatic ducts; compare with Figure 3. Phloxine methylene blue stain, × 30.

duodenum and in the papilla lateral to the ducts in many specimens.

No papillomas or true adenomas were demonstrated in the study. Hyperplasia

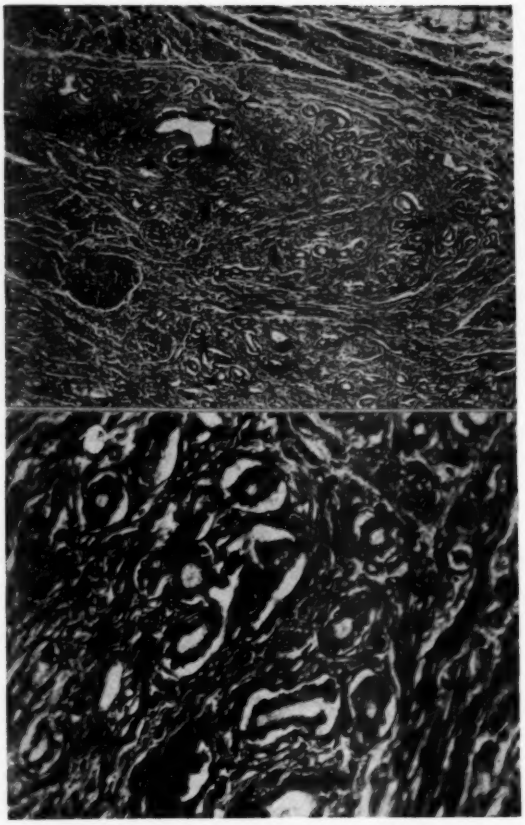

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FIG. 5. Masses of accessory pancreatic ducts contained in dense connective tissue stroma; note the smooth muscle bundles in the lower and upper middle parts of the field. Phloxine methylene blue stain, × 100.

FIG. 6. High power magnification of ducts shown in Figure 5. (× 350.)

of the epithelium on the tip end of the papilla termed "adenomatoid hyperplasia" by Baggenstoss[1] and Dardinski[15] was noted in approximately 15 per cent of specimens. (Fig. 3.) These authors considered this lesion a precancerous change. The cellular changes observed by us in this study were not unusual enough to warrant such an opinion. It must be admitted, however, that the tumor observed in Case 11 was a papillary adenocarcinoma and this type of tumor would be expected to arise from the hyperplastic change observed in the so-called "adenomatoid hyperplasia" of the papilla. (Fig. 8.)

The significance of the accessory pancreatic ducts found in considerable numbers in nearly all duodenal papillas lies in their possible relationship to obstruction of the biliary and pancreatic duct systems

and in the pathologic diagnosis of neoplastic disease in biopsies taken from the papilla. Because of the anatomic arrangement of the accessory pancreatic ducts occurring in packets of small alveoli that penetrate smooth muscle bundles of the wall (Fig. 5) their differentiation from neoplastic epithelium becomes a problem of major magnitude to the pathologist in the study of biopsies taken from the papilla. (Fig. 6.) The pathologic diagnosis of cancer made in Case 1 was rendered only after a most careful study of the microscopic sections which had been cut at all levels of the block. This diagnosis was concurred in by a consulting pathologist. It was based on what was interpreted as unequivocal evidence of invasion of epithelium although mitotic figures were lacking and the staining properties of the cells were not unusual. The results of our subsequent study have clearly shown this diagnosis to be incorrect because the structures interpreted as tumor alveoli were nothing more than packets of pancreatic ducts penetrating muscle bundles in the wall of the duodenum. (Fig. 7.) Since the diagnosis of cancer was incorrect, what was the cause of the obstruction and biliary disease from which this patient suffered? The clinical history indicating repeated attacks of acute infection was verified in the biopsy study in which evidence of acute inflammation and interstitial edema of the papilla was observed. (Fig. 7.) The acute papillitis with its attending edema was adequate explanation for the obstruction. However, the genesis of the acute papillitis is more obscure. Acute papillitis of the major duodenal papilla as a primary disease, has not been reported to our knowledge. Its occurrence appears reasonable since the papilla usually projects into the lumen of the duodenum and consequently is subjected to repeated traumas from the duodenal contents. Evidence of chronic inflammation with infiltration of lymphocytes and plasma cells in the mucosa of the papilla was found in the sections studied in a high percentage of specimens. Acute inflammation theoretically could result from trauma to the papilla and injury to the accessory pancreatic ducts emptying there. Acute or subacute inflammation and edema of the papilla, particularly one that was surrounded by large numbers of accessory pancreatic ducts and connective tissue stroma, could readily produce sufficient obstruction to cause jaundice. There would seem to be no valid reason why the accessory pancreatic ducts of the papilla should be regarded as predisposing factors in the genesis of carcinoma of the papilla any more than that this ductal epithelium predisposes to the origin of cancer in other parts of the pancreas. The atypical hyperplasia of the epithelium on the tip of the

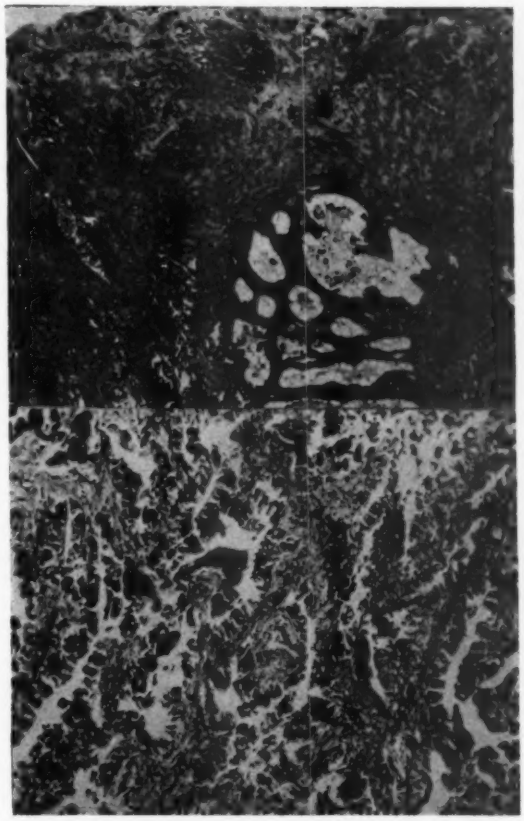

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FIG. 7. Case 1. Section from biopsy of papilla; slightly dilated accessory pancreatic ducts are seen in markedly edematous connective tissue between small fascicles of smooth muscle. Polymorphonuclear leukocytes infiltrate all parts of the field. Phloxine methylene blue stain, × 80.
FIG. 8. Case 11. Tumor; note papillary arrangement of columnar epithelial tumor cells on moderately prominent connective tissue stroma. Phloxine methylene blue stain, × 80.

papilla termed adenomatoid hyperplasia could more reasonably be regarded as precancerous since it represents overgrowth of normal epithelial elements possibly initiated by trauma.

COMMENTS

The surgical world acclaims the operation of radical pancreatoduodenectomy as the most hopeful advance in the treatment of pancreatic carcinoma yet proposed. Some writers maintain that it should offer even greater promise in the treatment of malignant tumors of the ampullary region inasmuch as these lesions are generally regarded as of low grade malignancy. This point deserves thoughtful consideration if one accepts the repeated assertions of various investigators that tumors of this region are exceedingly difficult to diagnose at the operating table and frequently confuse the pathologist although he may possess the advantage of a microscope and serial sections of the tissue. There are several references in the recent literature to pancreatoduodenectomy performed for supposed carcinoma of the ampulla in which the final diagnosis indicated a benign lesion. Case I is an example of such an error and serves to emphasize further the pitfalls encountered by the pathologist in identifying lesions situated in or near the papilla. In Case II both the surgeon and the pathologist after direct inspection of the ampulla through the opened duodenum erroneously concluded that no tumor was present to explain the obstruction in the terminal portion of the choledochus. The patient died later and at autopsy a small, non-ulcerated papillary carcinoma of the papilla of Vater was discovered. In neither of the two cases of carcinoma of the papilla herein reported was there evidence of local extension of the tumor or of metastasis. In the case of papillitis a modified Whipple procedure was elected because of a firm swelling involving the adjacent pancreas.

One may logically question the rationale of removing the proximal pancreas and duodenum in the treatment of papillary carcinoma on the premise that such an operation fails to satisfy the fundamental considerations which govern the attack on cancer in all other situations, that is, the removal together with the primary tumor of the regional and efferent lymphatics as far as and including the first group of recipient nodes. Although the exact schema of the lymphatics of the papilla is not known owing to the difficulty of observing the behavior of infused media *in vivo*, it can be assumed from postmortem studies in which malignant tumors of this region have metastasized that the preaortic and periportal nodes comprise the first group to receive efferent lymphatics from the terminal choledochus and the adjacent duodenum. Moreover, in reviewing the cases discussed in the literature one is impressed with the observation that the liver is apparently involved in metastasis as frequently as is the pancreas the site of invasion. These considerations should rightfully suggest the question, "What constitutes a radical operation for primary cancer in this area?" A second impression which such case reports afford is that unlike carcinoma of its neighboring organs, the stomach and pancreas, the majority of malignant neoplasms of the papilla of Vater when seen at the operating table exhibit no evidence of local extension or of lymphatic dissemination.

In consideration of the aforementioned observations and until long term results have proved the superiority of the more radical pancreatoduodenectomy, it would seem reasonable that for tumors which appear to be localized to the ampullary region the more conservative transduodenal excision is the procedure of choice. This operation is easier to perform and offers the advantage of conserving bridges. Should subsequent pathologic studies disclose a pervasion of the duodenal wall by tumor cells a more radical attack can be made at a second operation.

The seventeen cases of transduodenal excision of the ampulla reviewed by Hunt[16]

in 1934 together with his later report[17] in 1941 in which he appended his earlier list with fifteen additional cases represent the most encouraging results to be found in the recent literature. It may be argued that while many of these patients were living and well at the time of the report, insufficient time had transpired to warrant any deductions. However, it is noted that six were living and well two or more years after surgery and that two were living and well after five and eight years, respectively. A collection of the reported patients with ampullary carcinoma operated upon by transduodenal excision since 1941, when added to Hunt's[17] appended series of that date, indicates an operative mortality for this procedure of 3.7 per cent since 1935. An analysis of these patients is of interest with respect to end results in that the average duration of life for those who eventually died as the result of recurrence or metastases was sixteen months; Hunt's two patients died after twenty-five and thirty-three months, respectively. No attempt was made to bring his appended series to date but sixteen of the twenty-seven patients reviewed were living and well at the time reported and of the total number eight were dead from causes related to the primary disease. There are as yet no comparable statistics among the patients subjected to pancreatoduodenectomy. A review of the literature since Hunt's last report reveals only eleven published cases of transduodenal excision. Since this corresponds to the period during which the Whipple operation together with its several modifications has fascinated the surgical world, it is probable that in the majority of such cases the more radical procedure has been used. In each of Cattell's twelve cases a radical resection was done. Orr recently published a review of eight cases in all of which the radical operation was used.

CONCLUSIONS

One cannot escape the conviction that tumors of the major duodenal papilla remain a diagnostic and therapeutic challenge. Earlier recognition can be accomplished by more careful inquiry into the cause of jaundice, the more frequent use of the cholangiogram at the operating table and greater courage in exploring the second portion of the duodenum. It is our opinion that when feasible all suspicious lesions of the papilla should be locally excised, the defect repaired or the pancreatic and common bile ducts reinserted into the duodenal wall and the excised specimen carefully studied by a competent pathologist. Evidence of penetration of the duodenal wall by a malignant tumor should demand a secondary operation with removal of the pancreatic head and the duodenum together with the distal portion of the choledochus. The surgeon and the pathologist should be alert to the possibility of an acute papillitis as an explanation for ampullar obstruction.

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It is well known that a large articular branch from the posterior division of the obturator nerve innervates an extensive area of the anterior capsule of the hip joint. For this reason avulsion of the obturator nerve is indicated in certain cases of painful hip, especially in elderly and feeble individuals who cannot stand more extensive surgery. The surgical approach is to be had through the femoral triangle. It is wise, however, to restrict the operation solely to those patients who experience relief of pain, especially of pain on walking, after a novocain injection to block this nerve temporarily. Among these latter one may expect good to excellent results in about half of the cases. (*Richard A. Leonardo, M.D.*)

DIAGNOSTIC VALUE OF THE BLOOD PATTERN IN CANCER

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IN the hope of bringing about improvement in the results of therapy in cases of carcinoma through earlier diagnosis of the lesion the blood pattern test explained in detail hereafter and previously reported in 1942[1] and 1944[2] has been employed at the Tumor Clinic of the Union Hospital since July 3, 1947.

The test is simple and requires very little time and equipment. The pulp of the middle finger is punctured with a Hagedorn or other type of sharp needle. A needle which makes a round wound should not be used because of too rapid sealing, yet the wound should be deep enough to permit the blood to flow freely. A clean glass slide is then touched lightly to the finger tip; too much pressure will dilute the blood with tissue fluid. Three drops of blood are collected at intervals on the slide which is righted and set aside to dry, care being taken not to smear the drops. Upon drying a pattern becomes visible if the blood is not too thick; this pattern can be examined macroscopically and microscopically. It is wise to prepare two slides at each examination.

The macroscopic appearance of the normal blood pattern is seen in Figure 1. It should be noted that the first drop taken is usually too thick and the pattern less discernible. The pattern formed on drying in the second and third drops is a more reliable indicator of the presence or absence of malignancy. If all the drops are too thick, the test must be repeated with less pressure applied to the finger tip.

After the drops on the slide have been allowed to dry thoroughly undisturbed, they may be examined macroscopically and under high dry power magnification. The blood of non-cancerous individuals differs markedly from that taken from patients with cancer. As the normal drop dries, a dark mass appears centrally. Under the microscope the fibrin content of the

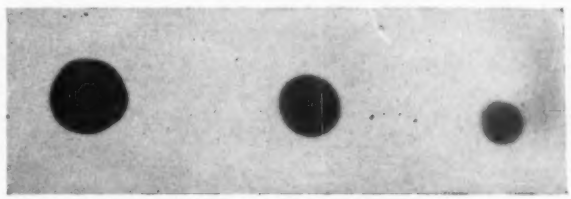


FIG. 1. Normal, macroscopic.

blood is seen in the well formed strands of varying size and thickness which interlace to form a web enmeshing the corpuscles. Leukocytes are few and the red cells tightly packed. Rouleau formation is present, with no variation in the size or shape of the red blood corpuscles. (Fig. 2.)

The fibrin is one of the valuable constituents of normal blood. It is a fine, invisible network circulating in the blood continually. Upon exposure to the air the fibrin oxidizes and contracts and becomes visible under the microscope in the negative blood pattern.

In the drop of cancerous blood no mass can be made out in the center. The blood breaks down into "dots." Microscopically no rouleau formation can be made out. The red cells are grouped in disorderly heaps and some appear shrunken and of indistinct outline. Many of the cells have hemolyzed, the time of hemolysis varying, and this abnormal change is more pronounced in cases with metastases. The appearance is one of agglutinated cells in lakes of plasma. Granules, spicules or rays are numerous, occurring either singly or in clumps. The fibrin content is greatly reduced, almost nil. (Fig. 3.)

After preparing thousands of slides on cancerous subjects it has become possible to discern different degrees of malignancy

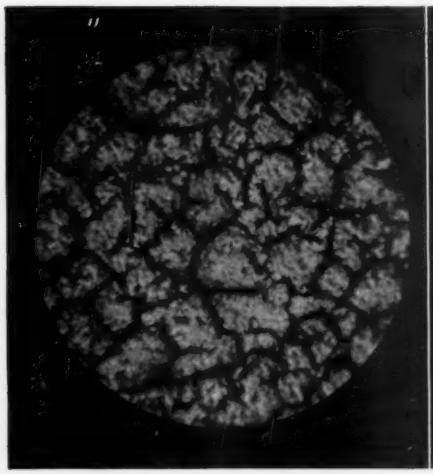


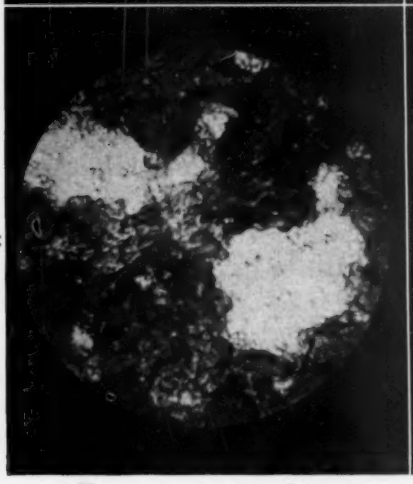
FIG. 2. Normal pattern, microscopic.

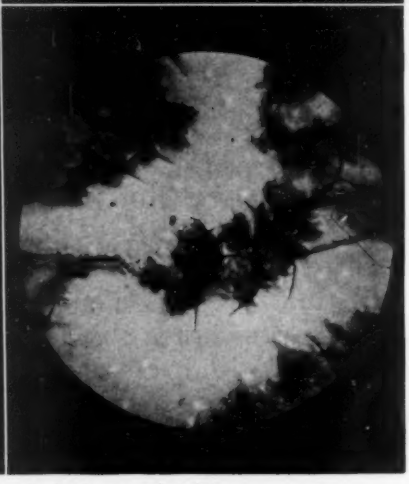
FIG. 3. Positive pattern, microscopic.

4A

4B

4C





4D

FIG. 4. A to D, transition from early lesion to full bloom cancer.

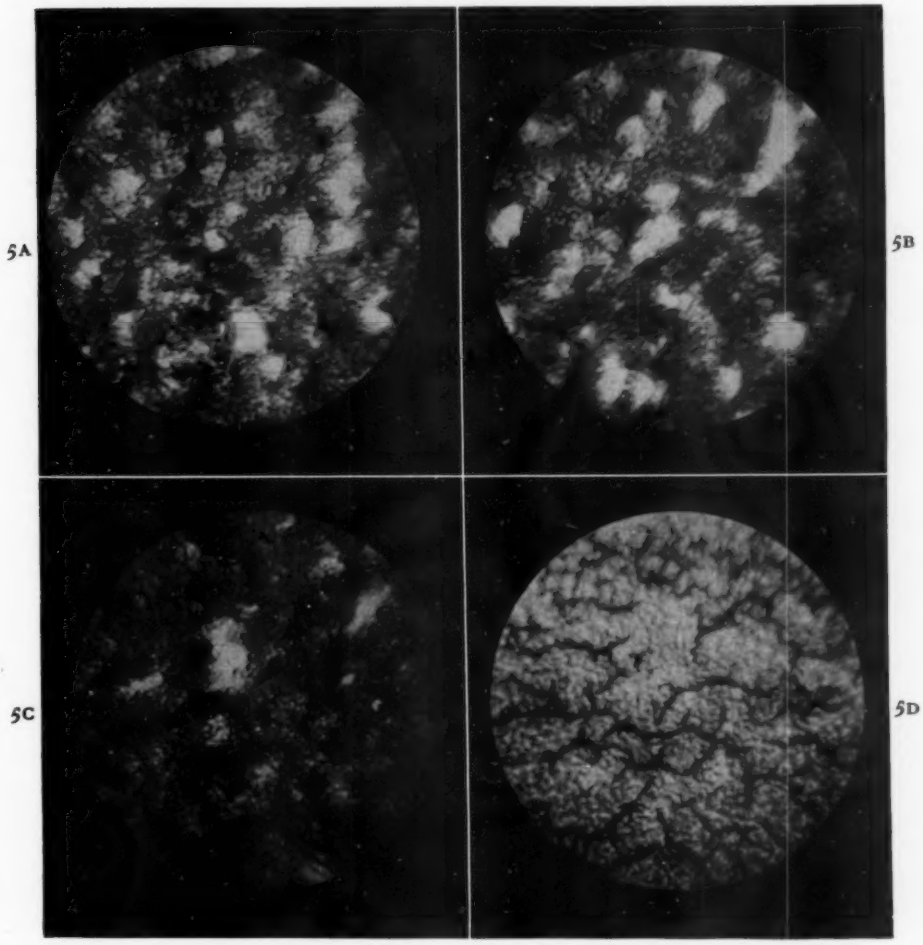


FIG. 5. A to D, transition of negative fluid drop; high power magnification.

from the early to the full bloom pattern. There is a progressive change in the fibrin formation and an increase in the size and number of the plasma lakes, with a decrease in the number of red blood cells. The cells become more and more distorted, agglutinate and form thick islands with many three-cornered, tri-asteroid spicules scattered throughout, as in Figure 4. Thus, any given specimen can be compared with one of these four positive patterns and the stage of malignancy approximately determined.

In an endeavor to discover what took place in the drop of blood during the drying process, photomicrographs were made at intervals of three minutes under high power dry magnification. (Fig. 5.) Eight transitional images of the fluid drop of negative blood were photographed; then the same procedure was carried out with the fluid drop of positive blood and the two series of photomicrographs compared. (Fig. 6.)

It was noted that in the negative drop the circulating cells did not agglutinate. Small lakes formed at first but the red cells remained uniform, began to pack together to form rouleaux. Fibrin emerged from the periphery, formed strands, became heavier and seemed to force the cells closer together until the strands filled the whole field. The final image showed the reticular network with cells enmeshed—the pattern of normal or non-cancerous blood.

By contrast, in the positive drop the blood cells became disarranged early and small, numerous lakes appear. Rouleau formation did not take place. There was clumping of the red blood cells with some

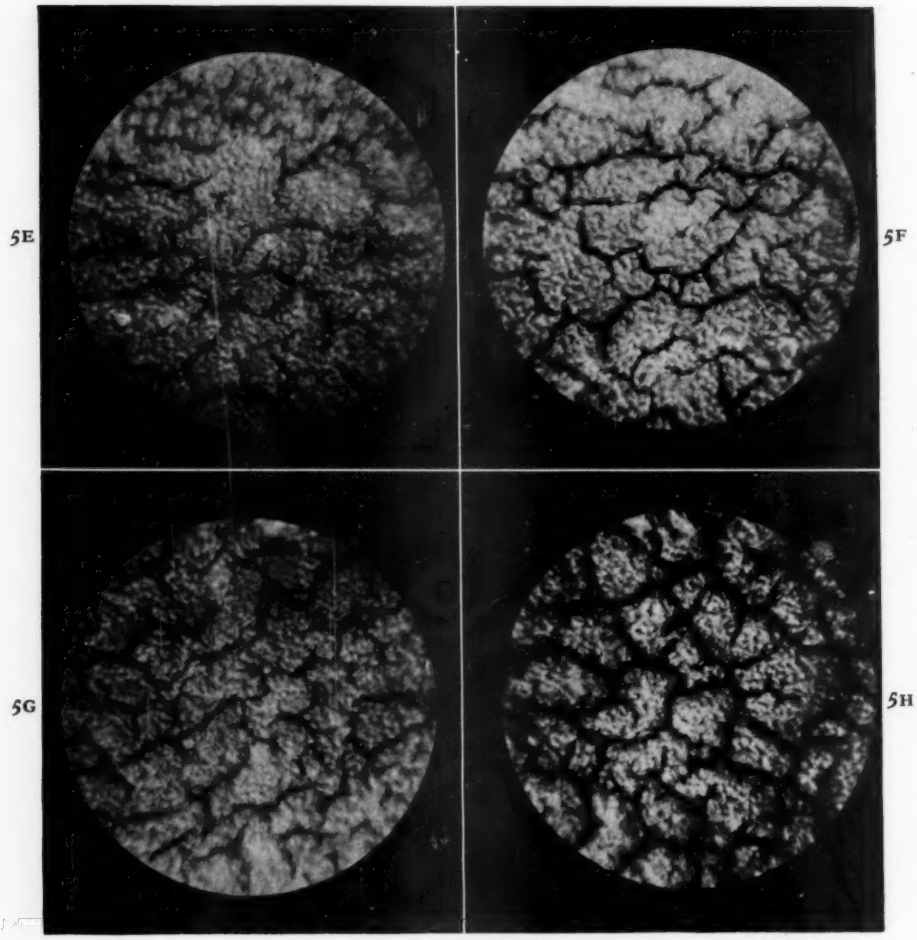


FIG. 5. E to H, transition of negative fluid drop; high power magnification.

becoming superimposed on others; as the breaking-down process continued, granules appeared in the lakes and an adhesive, protein-like substance caused the circulating cells to agglutinate. The final photomicrograph was that which we have come to know so well as the characteristic cancer pattern.

The criteria for diagnosis may be summed up as follows:

Negative Pattern	Positive Pattern
Appearance of fibrin in a reticular network	Absence of fibrin
Rouleau formation	Lack of rouleau formation
Rapid blood spread	Viscid blood
Stability of the red cells	Agglutination of the red cells
Close, even, mosaic pattern or meshwork	Formation of lakes and islands interspersed with granules and spicules

In order to determine the reliability of this simple cancer test it was decided to chart the results in 800 individuals who are classified in four different groups according to their reaction to the test.

Group one comprised 137 subjects, 15 male and 122 female, among the hospital personnel, all apparently in excellent health. In two of the women the test brought to light the presence of early malignancy, cancer of the cervix in one and cancer of the breast in the other.

The second group of subjects examined comprised those patients with a variety of conditions which were known to be benign. Slides were not made on pregnant women or patients receiving transfusions, factors which give a positive reaction; in this group of 337 patients the blood pattern was negative in every instance, as seen in Table 1.

The third group consisted of 198 cases

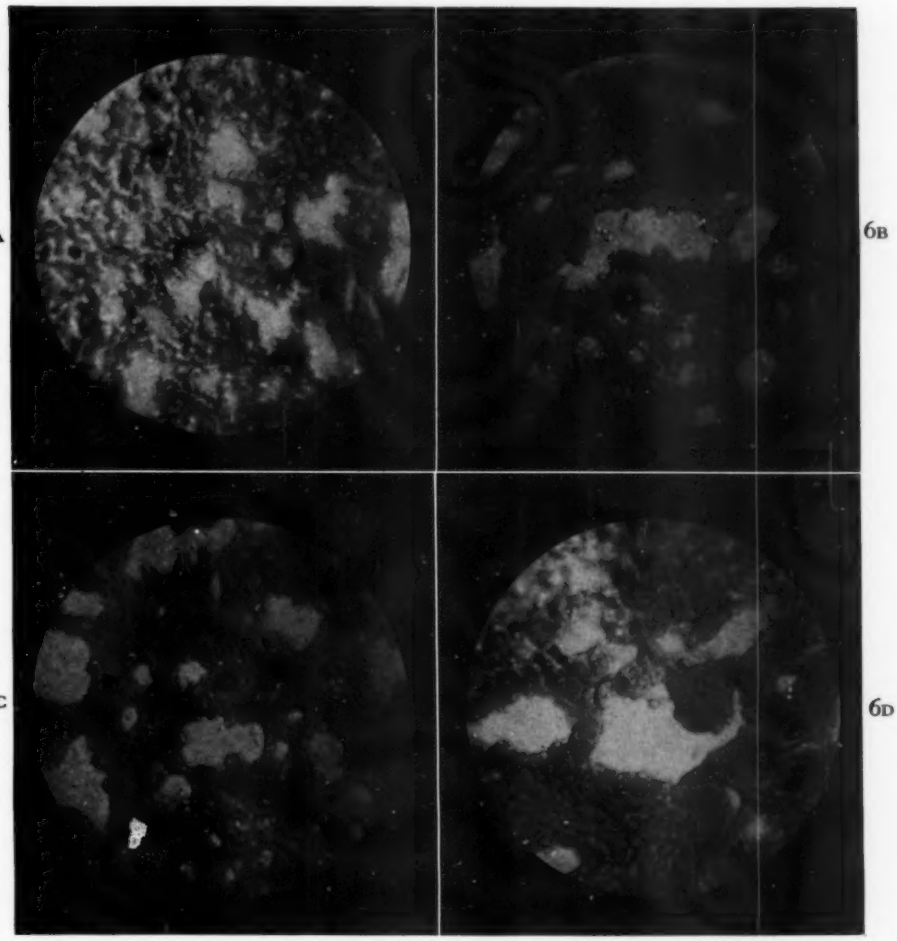


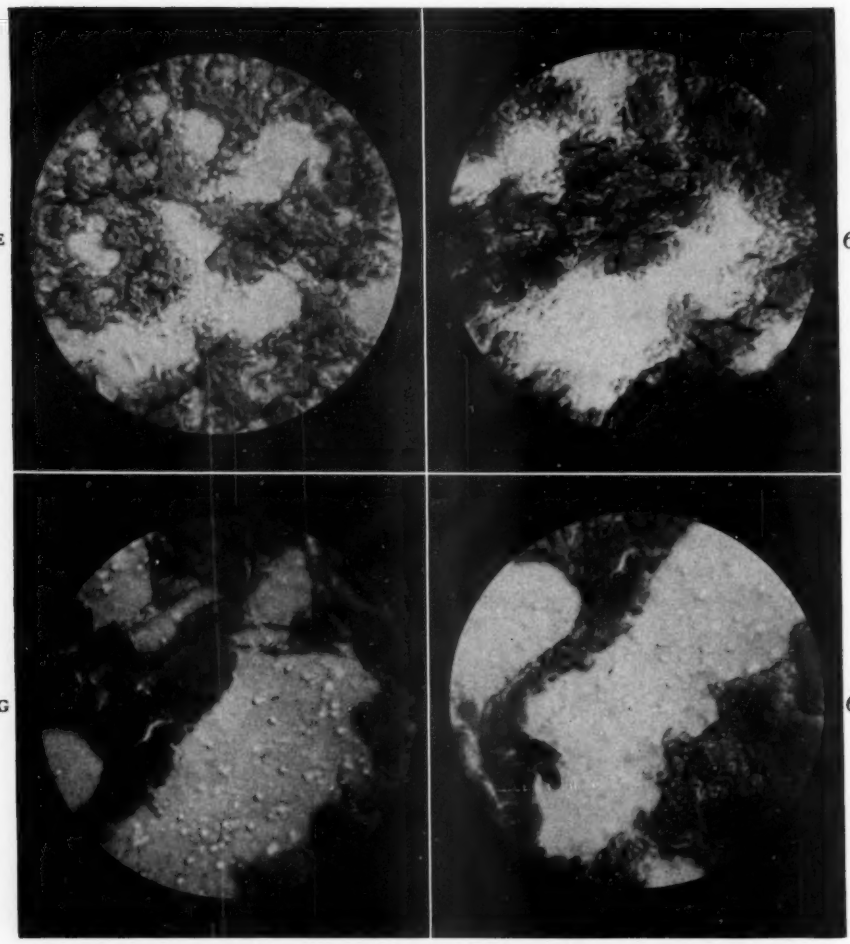
FIG. 6. A to D, transition of positive fluid drop; high power magnification.

of proved cancer. All of these individuals were admitted to the Tumor Clinic of the Union Hospital since July, 1947. They were given the usual routine diagnostic tests including the collection of drops of blood on the slides.

Table II lists the site of the lesion, type of neoplasm, result of the test and the total number of cases. In 191 of the 198 cases the blood drop showed the positive pattern of malignancy; thus, the results were correct in 96.5 per cent of the cases. The test was evaluated along with clinical and laboratory findings but in some cases it was the sole clue to the presence of malignancy somewhere in the body. The test proved to be more accurate in this group than in the group of 140 patients reported in 1942, in which results were correct in 128 cases, or 91.4 per cent.

The false negative slides, seven in number, were reviewed in an effort to discover a reason. In the four cases of basal cell carcinoma of the skin the drops on the slide appeared rather thick; this may have accounted for the incorrect reading. Also, in the case of carcinoma of the pancreas operation and biopsy proved the slide incorrect. When the test was repeated at intervals during follow-up study of the patient, the pattern was always positive, indicating that operation did not bring cure. The patients with cancer of the lung and cancer of the cervix had both been given blood transfusions; this may have been the factor which changed the composition of the blood at the time the sample was taken.

The last group includes the results of the test made on patients treated with surgery, irradiation or radium implantation for



6E 6F 6G 6H

FIG. 6. E to H, transition of positive fluid drop; high power magnification.

malignancies of various kinds who returned to the Clinic for a check-up at frequent intervals. Seventy-seven of the 128 patients treated showed the same positive pattern after therapy. However, in some instances the change in the pattern from positive to negative was dramatic after therapy and, as a rule, the blood pattern paralleled the clinical course.

The following four case reports illustrate the unfortunate end result when the blood pattern was ignored or when the search for the site of the neoplasm was not thorough enough:

CASE REPORTS

CASE 1. V. F., a female aged thirty-eight, was first seen at the office in February, 1941, with a swelling in the right forearm of two months' duration. The blood pattern was found positive for cancer. She was referred to Pondville Cancer Hospital for study. X-ray examination revealed an irregular area of new bone formation in the region of the upper third of the shaft of the right ulna. No definite destructive changes were found in the bone. Two Hinton blood examinations were positive. An exploration was carried out and a tumor mass which involved the periosteum of the shaft of the right ulna was excised. The histopathologic diagnosis was luetic osteitis. Antiluetic treatment was given by her local physician.

The following May x-ray examination revealed only a very slight trace of periosteal thickening in the region of the previous lesion. The blood pattern, however, remained positive. The Hinton blood examination was negative and remained so.

In January, 1944, an osseous growth was excised from the right forearm at the Truesdale Hospital. The pathologic diagnosis was myositis ossificans of the right forearm. The blood pattern was still positive. She was readmitted to

the Truesdale Hospital in January, 1945, for excision of the recurrent growth. The pathologic report was again myositis ossificans of the right forearm; there were no signs of malignancy. The blood pattern was positive.

In January, 1946, she was admitted to the Fall River General Hospital for excision of a recurrent growth at the same site. The report was again myositis ossificans. Excision was necessary again in August, 1946, and for the first time the pathologic report was (?) osteogenic sarcoma.

In October, 1946, tissue removed for biopsy showed osteogenic sarcoma, sclerosing type, and an amputation of the right arm was performed.

This woman returned to the Tumor Clinic June 3, 1948, complaining of hoarseness, difficulty in swallowing and cough, and stated that she had had one hemorrhage from the throat or lungs. The blood pattern was now more definitely positive (3). X-ray examination of the chest revealed markedly increased markings involving both lung fields together with many small, dense bodies. These markings were old and consistent with pulmonary tuberculosis. At the right base was an area of increased density which appeared new and active; this was interpreted as pneumonitis.

She continued to complain of dyspnea and bloody sputum and was referred to Massachusetts General Hospital where after bronchoscopy and x-ray examination a diagnosis was made of multiple pulmonary metastases. The

TABLE I

GROUP OF 337 PATIENTS WITH A VARIETY OF BENIGN CONDITIONS

BLOOD PATTERN NEGATIVE IN EACH CASE	
Anemia, macrocytic	10
Aneurism, aortic	2
Appendicitis	4
Arthritis	7
Benign hypertrophy, prostate gland	5
Benign tumors	54
Bronchitis	8
Cardiospasm	5
Cervical and endometrial polyps	5
Cholecystitis	10
Cirrhosis of liver	2
Cystocele and rectocele	4
Diverticulosis	8
Duodenal ulcer	7
Eczema	20
Endocervicitis	23
Gastritis	6
Goiter	8
Hernia	6
Herpes zoster	2
Hypertension	15
Hypothyroidism	4
Keratosis	38
Lymphadenitis	6
Mastitis, chronic cystic	29
Metrorrhagia	5
Menopause	10
Osteitis deformans	4
Parotitis	4
Syphilis	1
Urethral calculi	2
Uterine fibroids	9
Uterine prolapse	4
Varicose ulcers	2
Visceroptosis	8
	337

TABLE II

DISCOVERED CASES OF CANCER

Site	Type	Positive Pattern	Negative Pattern	Total No. Cases
Femur	Osteogenic sarcoma	1	..	1
Humerus	Osteogenic sarcoma	1	..	1
Radius	Ewing's sarcoma	1	..	1
Mandible	Epidermoid carcinoma	1	..	1
Mandible	Osteogenic sarcoma	1	..	1
Ribs	Reticulum cell sarcoma	1	..	1
Breast	Adenocarcinoma 18 Medullary 8 Scirrhous 10 Comedo 1 Intraductal 1	38	..	38
Ear	Basal cell carcinoma	1	..	1
Eye	Melanosarcoma	2	..	2
Face	Basal cell carcinoma	1	..	1
Lip	Squamous cell carcinoma	4	..	4
Tongue	Epidermoid carcinoma	2	..	2
Tongue	Adenocarcinoma	2	..	2
Skin	Epithelioma	10	..	10
Skin	Basal cell carcinoma	28	4	32
Skin	Squamous cell carcinoma	16	..	16
Skin	Melanoma	1	..	1
Cervical lymph node	Adenocarcinoma	1	..	1
Salivary gland	Adenocarcinoma	1	..	1
Parotid gland	Medullary carcinoma	2	..	2
Stomach	Adenocarcinoma	5	..	5
Cecum	Adenocarcinoma	1	..	1
Transverse colon	Adenocarcinoma	1	..	1
Sigmoid	Adenocarcinoma	1	..	1
Rectum	Adenocarcinoma	9	..	9
Liver	Adenocarcinoma	2	..	2
Pancreas	Adenocarcinoma	2	1	3
Kidney	Adenocarcinoma	2	..	2
Bladder	Papillary carcinoma	3	..	3
Prostate gland	Adenocarcinoma	6	..	6
Lung	Epidermoid carcinoma	2	1	3
Larynx	Epidermoid carcinoma	5	..	5
Cervix	Epidermoid carcinoma	21	1	22
Uterus	Adenocarcinoma	8	..	8
Ovary	Thecoma 1 Dysgerminoma 1	2	..	2
Vagina	Mesodermal carcinoma	1	..	1
Vulva	Epidermoid carcinoma	1	..	1
Leukemia		2	..	2
Hodgkin's disease		1	..	1
Lymphoblastoma		1	..	1
		191	7	198

patient failed steadily. The last blood pattern was taken February 12, 1949, and was a positive 4. She entered the Fall River General Hospital in March, 1949, and died May 20, 1949.

Case II. E. M., a sixty-eight year old male, was seen at the Union Hospital Tumor Clinic June 19, 1947, complaining of vomiting, weakness and loss of weight. For several months he had had a considerable amount of gas and belching and vomited occasionally; he found that he got along better if he ate soft foods. There was no pain. His past history included a prostatectomy at the Truesdale Hospital in 1943 for benign hypertrophy of the prostate. In 1944 he was readmitted for hematuria. Cystoscopy revealed only cystitis. During 1944 he was given three blood transfusions and seemed to improve for a time. He was treated for cystitis but seemed to lose ground gradually and in the next three years his weight loss was from 190 to 152 pounds. When seen in July, 1947, he looked decidedly ill and his skin was flabby and dry. The blood pattern was a positive 4 and a diagnosis of cancer of the stomach was made. X-rays of the gastrointestinal tract and gallbladder were made. The stomach was normal in size and position with no evidence of deformity. Over a period of sixty-eight hours sluggishness of the barium flow was noted; otherwise the examination was negative. The gallbladder showed poor function but there was no evidence of stones.

The blood pattern repeated July 16, 1947, was strongly positive, but the examiners were unable to find any site of malignancy. Blood patterns taken August 7th, September 11th and September 15th did not change. When admitted to the hospital on this last date the patient was considered too weak to withstand an exploratory laparotomy. He died October 5th. Postmortem examination revealed carcinoma of the left kidney with pulmonary metastases.

Case III. M. P., a sixty-four year old female, was first seen at the Tumor Clinic July 8, 1948. She stated that dilation and curettage with radium implantation was done June 12, 1947, for vaginal bleeding of five weeks' duration. The pathologic report was carcinoma of the cervix, grade III. She also had deep x-ray therapy, a total of 860 r. When examined August 14, 1947, the blood pattern was positive (3), although the cervix had completely healed and there was no vaginal bleeding, and clinically it seemed to be an excellent end result. Blood patterns on September 11th, October 9th and 25th and January 8, 1948, and April 8th were all positive. At the last examination the patient said that she had noted rectal bleeding for about two weeks. A barium enema on April 23rd showed no evidence of deformity. On June 15, 1948, the intestines were explored and a number of scybala were found along with a considerable number of adhesions, but no malignant lesion. In the face of the persisting positive blood pattern, operation was performed July 8, 1948, and a new growth was discovered on the anterior wall of the rectum high in the ampulla, which had eluded the sigmoidoscope. The pathologic diagnosis was adenocarcinoma of the rectum. The blood pattern remained positive until the death of the patient on December 31, 1948.

Case IV. J. L., a seventy-eight year old male, was first seen at the Union Hospital Tumor Clinic September 1, 1948, having been referred because of an enlarged prostate gland. He stated that his gallbladder was removed in 1918 and he had since remained well until June, 1948, when he began to have episodes of vomiting and diarrhea and some rectal pain. Rectal examination on September 1st revealed a very large, soft prostate gland with no evidence of malignancy. The blood pattern was a positive 1. The patient was referred to the Genitourinary Clinic but discharged because all findings were otherwise negative.

Nothing further was done for this man until he again visited the Tumor Clinic April 14, 1949 for persistent diarrhea and pain in the right lower quadrant of the abdomen. The blood pattern by now was a positive 4. Physical examination disclosed a large mass in the right lower quadrant which proved to be carcinoma of the cecum. The tumor mass was removed with wide excision of the bowel. The pathologic report was adenocarcinoma of the cecum. This patient remained in the hospital until his death on May 23, 1949.

These cases eloquently illustrate the tragic consequences of failure to heed the warning of the positive blood pattern. The site of the lesion was not always where the past history would suggest and for this reason one must be very vigilant and weigh all the evidence at hand. Whitney[3] pre-

sents an excellent list of diagnostic aids to be thoroughly and systematically carried out and emphasizes the need of interpreting the cancer pattern along with the results of many other diagnostic aids such as laboratory tests, a thorough history, clinical findings and roentgenograms.

Girón[4] in 1943 reported that his results were 90.4 per cent correct in 150 cases. He noted that sex, menstruation, age, exercise, food and hour of taking the test had no effect on the blood pattern. Pregnancy was the one physiologic state which changed the pattern and offered confusion in the interpretation of the blood pattern, but these cases were easy to differentiate. After delivery the blood pattern reverts to negative.

Norman and Slicher[5] state that the early diagnosis of cancer in any of its stages is the most important factor in the fight against it, and that the need for a simple, inexpensive, universally applicable test is a desideratum. They report their experience with a test meeting these specifications which should be an integral part of routine examinations performed in offices of physicians and dentists, in hospitals, clinics and public health surveys.

Tests were made routinely on all patients during the past two years. During that time more than 350 patients were tested, and in each case from eight to ten drops of blood examined, giving a total of about 4,000 drops. Their results obtained from the Bolen slide technic with the available clinical data showed an average accuracy of 97 per cent. This result corroborated the findings of Bolen, Gruner and Girón.

CONCLUSION

1. Early diagnosis remains a crucial factor in the discovery and control of cancer.

2. In contrast with the complicated technic required by the majority of tests now proposed for the detection of cancer, the bedside or office test outlined herein is simple, inexpensive and extremely accurate. Very little training is necessary to take the sample of blood and evaluate the different patterns on the slides which can be filed away and will keep indefinitely.

3. If the sample of blood is properly taken and accurately read and weighed with clinical evidence and laboratory and x-ray reports, every doctor's office might well become a detection center for cancer.

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CHOLEDOCHOLITHIASIS*

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THE frequent presence of common duct stones in patients with cholelithiasis is now a well recognized fact. The realization that patients with remaining common duct stones continue to have symptoms and also the knowledge that subsequent operations are difficult and hazardous has stimulated investigation of means for more accurate discovery and more thorough removal of these stones. These means involve the combined effort of the internist, the radiologist and the surgeon. Four illustrative cases are used in this study to emphasize the salient features of choledocholithiasis.

It is of value to note that in contrast to the frequent anomalies of the arteries and veins of the hepatic pedicle the gallbladder and extrabiliary ducts are very constant. In 500 cadavers examined by Daseler et al.[6] only twelve anomalies of the duct system were found. In a survey of 19,000 cadavers Boyden[5] found only a few major variations. Double gallbladders, double cystic ducts and variations in the hepatic and common ducts have been infrequently observed and reported.

Variations in the embryologic development of the biliary system are important because these changes complicate operative procedures and lead to unexplained difficulties in biliary tract surgery. The extrahepatic ducts arise from a sacculation of the hepatic diverticulum which is a ventral outgrowth of the foregut at the site of the future duodenum. The cranial portion of this sacculation differentiates into the liver and the hepatic and common bile ducts. The cystic duct and gallbladder arise from the caudal portion of the hepatic diverticulum and are removed from the duodenum by the lengthening of the common bile duct.

Clinically, the most common and important disease affecting the extrabiliary system is choledocholithiasis. The high incidence of this disorder has become more apparent as a greater percentage of common ducts have been explored. Best[2–4] stated that in a series of 100 consecutive cases he opened the common duct in 33 per cent and found stones in 17 per cent. A portion of a table prepared by O'Shea[10] shows this high incidence of common duct stones. (Table I.) This table illustrates the fact that when more common ducts are explored, more stones are found. This is also shown by the figures compiled at the Caylor-Nickel Clinic. (Table II.)

Since calculi are present in approximately 12 to 20 per cent of patients with gallbladder stones and cholecystitis, it is imperative that the indications for exploration of the common duct be well understood. Common duct stones should be suspected when there are signs and symptoms of biliary obstruction and cholangitis such as jaundice, acholic stools, pruritis, chills and fever. Exploration is indicated if any of the following are present: (1) jaundice or recent history of jaundice; (2) recent history of chills and fever; (3) palpable common duct stones; (4) enlarged common duct; (5) aspiration of muddy, dark bile from common duct; (6) many small stones in gallbladder; (7) persistent biliary symptoms following cholecystectomy and (8) x-ray evidence of common duct stones.

Even after discovery of common duct stones there is a real possibility of leaving one or more stones in spite of careful

* From the Caylor-Nickel Clinic, Bluffton, Ind.

scooping and irrigating. Best has attempted to reduce the incidence of remaining stones by use of pre- as well as postsurgical biliary flushes. Such flushes move stones from the high portions of the ducts and liver into the distal duct where they are more accessible to surgical attack. Cholangiograms taken at time of surgery are of aid not only in discovery of stones but also as a check on the thoroughness of their removal. To be of value the cholangiograms must be technically good. This requires that some form of anesthesia be used which will allow cessation of breathing during the exposure of the film. Spinal anesthesia with a cooperative patient will permit this. With inhalation anesthesia utilizing a gas machine, respiratory arrest may be accomplished by removing the carbon dioxide from the anesthetic mixture for five minutes before taking the x-ray. It also requires cooperation of the surgical and roentgenologic teams so that the operation will not be prolonged.

Even after careful surgery, postoperative cholangiograms will frequently show stones which have not been removed. This is especially so when there have been a very large number of stones in the ducts. Various kinds of non-surgical methods have been tried to remove these stones. This has usually meant injecting agents into the ducts in an attempt to dissolve the stones or so irritate the duct that the calculi will pass. Ether has been used but the pain resulting from leakage around the T tube makes it undesirable. It is also necessary that the ether be in contact with the calculi for a considerable period of time, which is difficult to accomplish. Solution G was used by Goldman[7] with success in two cases. We have had one case in which its use removed remaining duct stones (Case III). The solution also causes

TABLE I

INCIDENCE OF COMMON DUCT STONES IN PATIENTS OPERATED UPON FOR CHOLECYSTITIS OR CHOLELITHIASIS

Hospital Series	Operative Cases Cholecystitis	Percentage Common Duct Drainage	Percentage Common Duct Stones	Percentage Calculi in Drained Common Duct
St. Vincent's Hospital, N.Y., 1930–1940	1,438	6.4	5.3	82.8
Harlem Hospital, N.Y., 1930–1940	137	8.5	7.3	86.0
Post-Graduate Hospital, N.Y., 1920–1937	3,306	7.7	6.3	86.0
Lahey Clinic, 1910–1925	619	15.0	8.4	54.2
Lahey Clinic, 1925–1935	1,158	37.0	16.8	44.7
Massachusetts General Hospital, 1930–1935	1,228	32.0	13.0	42.0
Massachusetts General Hospital, 1935–1940	860	44.2	20.7	46.8
Peter Bent Brigham Hospital, 1913–1935	426	37.9	16.7	44.3

TABLE II

INCIDENCE OF COMMON DUCT STONES IN PATIENTS OPERATED UPON FOR CHOLECYSTITIS OR CHOLELITHIASIS

Hospital Series	Operative Cases Cholecystitis	Percentage Common Duct Drainage	Percentage Common Duct Stones	Percentage Calculi in Drained Common Duct
Caylor-Nickel Clinic, 1940–1947	247	17.4	7.45	43
Caylor-Nickel Clinic, 1947–1948	53	26.4	13.2	50

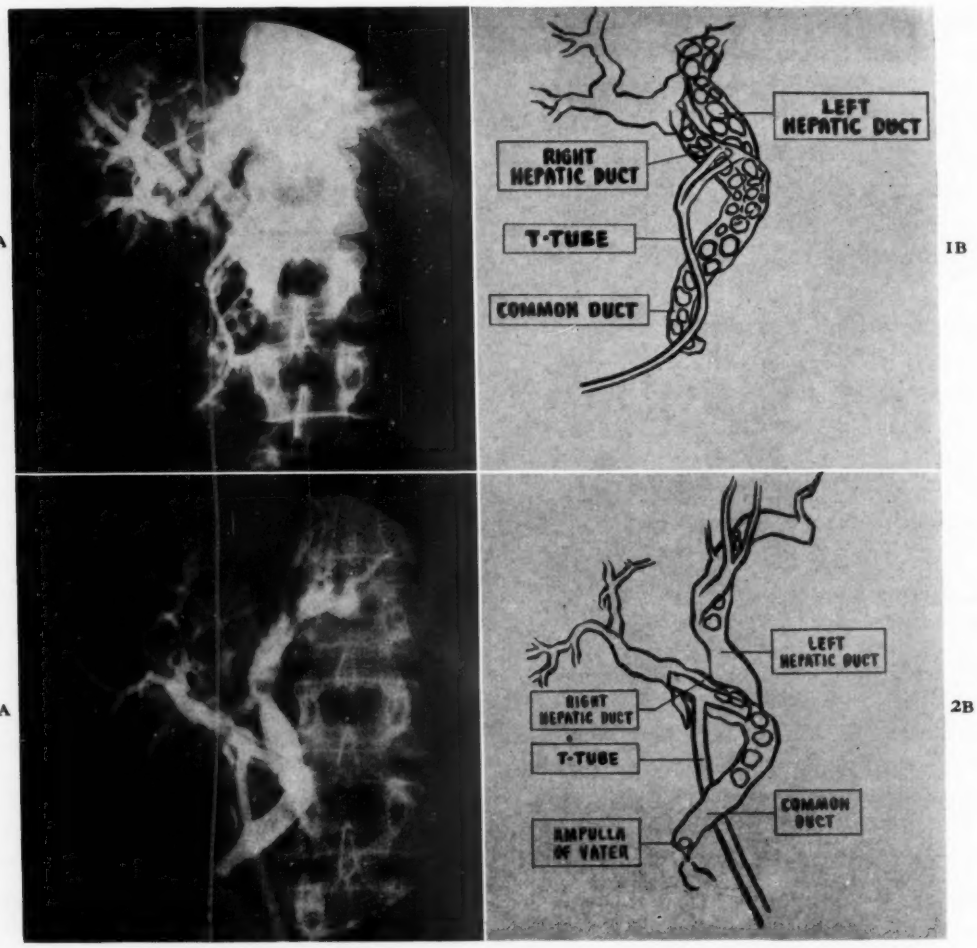


FIG. 1. A and B, case 1. A T tube is present which is partly extruded from the right hepatic duct. There are multiple calculi filling especially the common and left hepatic ducts, and occasional stones are present in the right hepatic duct.

FIG. 2. A and B, case 1. A second T tube has been inserted in the right hepatic duct. There are fewer calculi in the duct system. One small stone is present in the region of the ampulla. The common duct is slightly smaller in diameter. A trace of dye has entered the duodenum.

pain and shock if there is extravasation around the T tube. Its success is probably due to an irritant and cathartic action rather than to a solvent action. The biliary flush of Best probably utilizes more ways of removing the remaining duct stones than any other plan now devised. This flush relaxes the sphincter of Oddi with nitroglycerine, magnesium sulfate, atropine and olive oil or thick cream. It flushes the duct by increasing biliary flow with decholin and by irrigations of the duct via the T tube with saline and warm, sterile olive oil. This worker has reported many cases in which the remaining stones were passed by utilization of this method. Unfortunately some cases still remain in which all of these non-surgical means fail. In these reoperation is necessary.

The following are four cases which represent some of the common problems and difficulties in treatment of choledocholithiasis:

CASE REPORTS

CASE 1. G. F. (No. 58160), a forty-three year old white male, in April, 1947, had severe pain in the right upper quadrant radiating to the right infrascapular region. A cholecystogram showed poor concentration and stones could not be excluded. In August, 1947, he had a recurrence of pain in the right upper quadrant which was associated with jaundice.

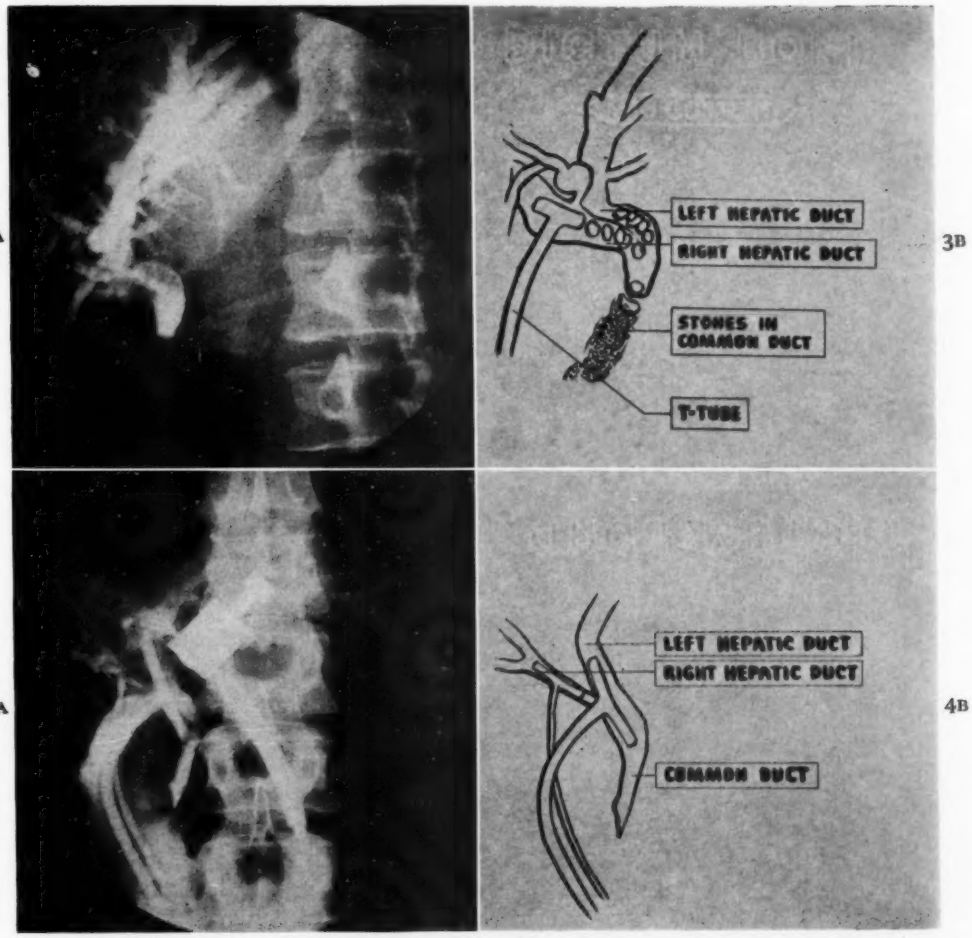


FIG. 3. A and B, case 1. After several three-day biliary flushes stones are for the most part in distal portions of right and left hepatic ducts. Some of the stones completely fill the distal portion of the common duct which prevents dye from entering this area. The oblique view clarifies the point of junction of the right and left hepatic duct.
FIG. 4. A and B, case 1. Two T tubes are present, one in the right hepatic duct and one in the proximal portion of the common duct extending into the left hepatic duct. The ducts are no longer dilated and no calculi are demonstrated.

A cholecystectomy and choledochostomy were performed in September, 1947. Many small cholesterin stones were found in the gallbladder but no stones were found in an enlarged common duct. On the fifteenth postoperative day when the T tube was clamped the patient had chills and fever. A cholangiogram using 35 per cent diodrast (Fig. 1) revealed an anomalous biliary duct system filled with stones.

A second operation was then done in October, 1947. The right and left hepatic ducts were opened and sixty stones measuring 1 to 5 mm. in diameter were removed. The operative findings, of which some facts were obtained and checked in the subsequent operation, revealed (1) absence of common hepatic duct, (2) right and left hepatic ducts separate to within 5 cm. of the duodenum, (3) cystic duct entered right hepatic duct and (4) the common duct was entirely retroduodenal.

The postoperative cholangiogram (Fig. 2) revealed numerous stones in the right and left hepatic and common ducts. The patient was given a three-day biliary flush and this was repeated five times in the following three months. Following these a cholangiogram (Fig. 3) showed stones impacted into the right and left hepatic and common ducts.

The patient then was operated upon for the third time. The common duct was opened and many small stones and much sandy material were removed. A postoperative cholangiogram (Fig. 4) showed no evidence of stones and the

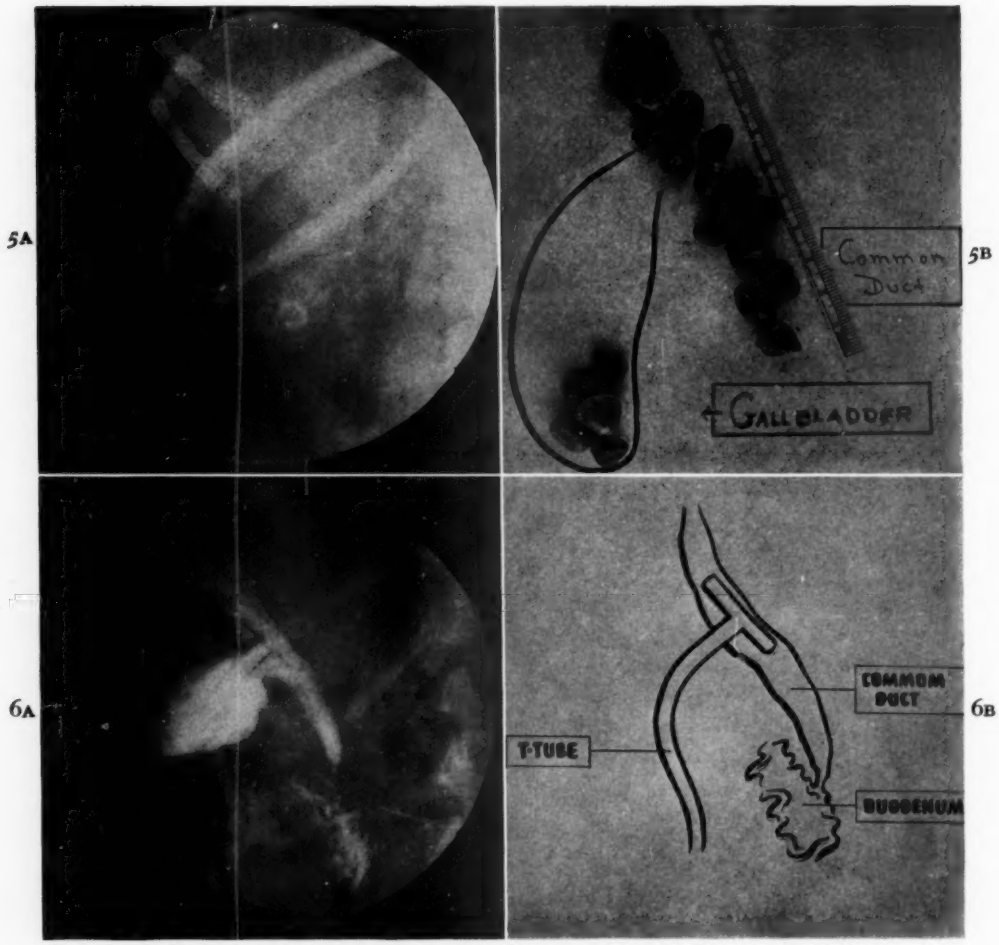


FIG. 5. A and B, case II. There is poor concentration of dye. Numerous faceted stones are seen, some in the gallbladder and some in the common duct.
FIG. 6. A and B, case II. Note absence of stones in common duct which is not appreciably dilated.

ducts were no longer dilated. The T tube was removed twenty-one days after the third operation. When last seen in May, 1949, the patient had no symptoms of choledocholithiasis.

CASE II. A. D. (No. 62035), a fifty-five year old white female, had had flatulence, vomiting and acute pain in the epigastrium, chest, left arm and upper back for only two weeks. She had had no jaundice, chills, fever or other evidence of biliary obstruction. An abdominal scout film first revealed radiopaque stones in the gallbladder and common duct which were seen more plainly in the cholecystogram. (Fig. 5.)

The patient was operated upon in December, 1947, and a cholecystectomy and choledochostomy were performed. The common duct was 2 cm. in diameter and many large stones were palpable. Twenty-one stones measuring from 5 mm. to 1 cm. in diameter were removed from the common duct and five were removed with the gallbladder.

The postoperative cholangiogram (Fig. 6) revealed no stones in the common duct. The T tube was removed and the patient has been well since. This case is unusual because of the large number of radiopaque stones in the common duct which were seen in a routine x-ray.

CASE III. A. L. (No. 55050), a sixty-one year old white female, in 1935, eleven years before her present admission, had undergone a cholecystectomy for gallbladder calculi. For one and a half years prior to admission she had had episodes of chills, fever, vomiting and jaundice.

A choledochostomy was therefore performed and over 100 irregular sized stones were removed from the common duct. The largest

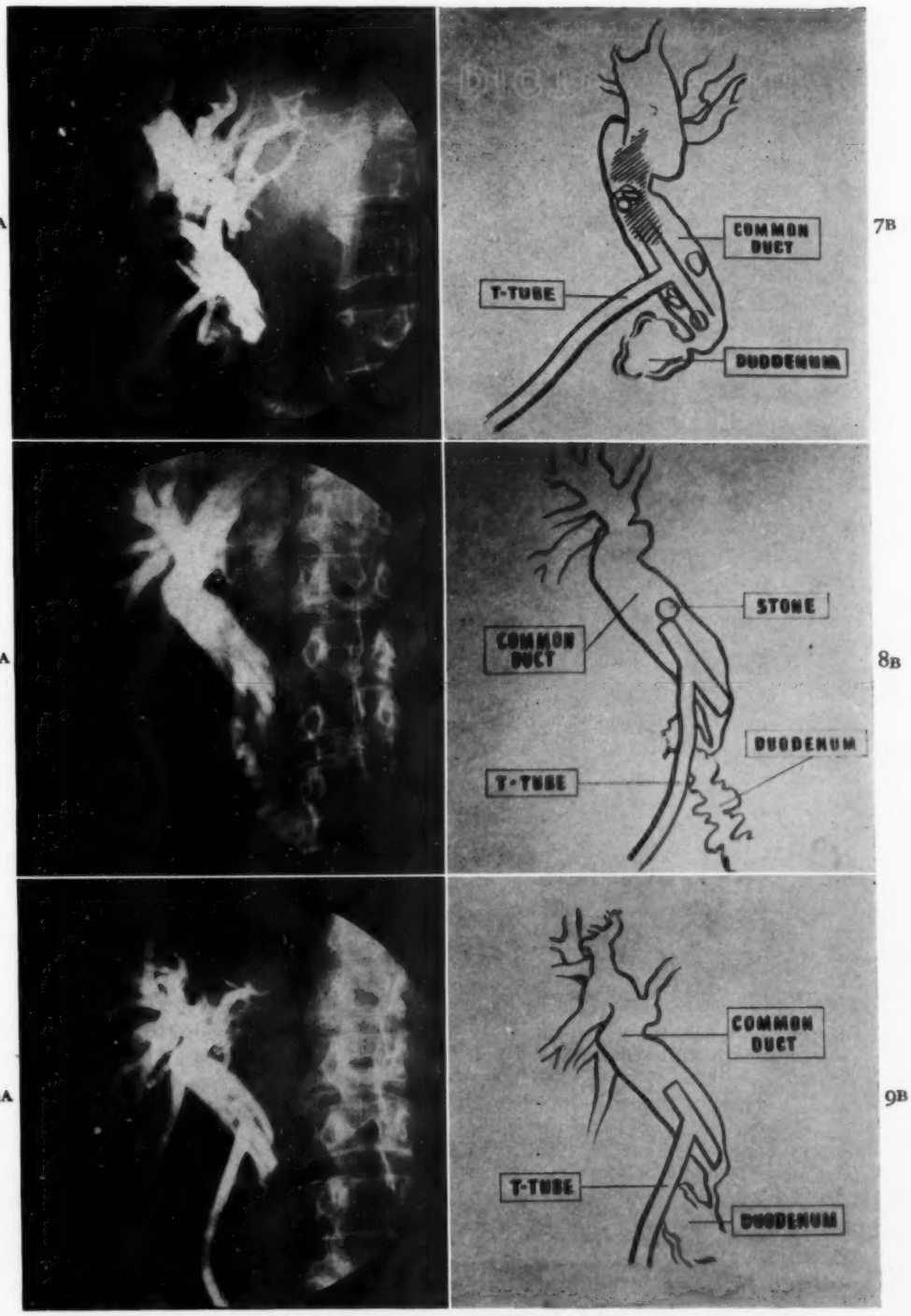
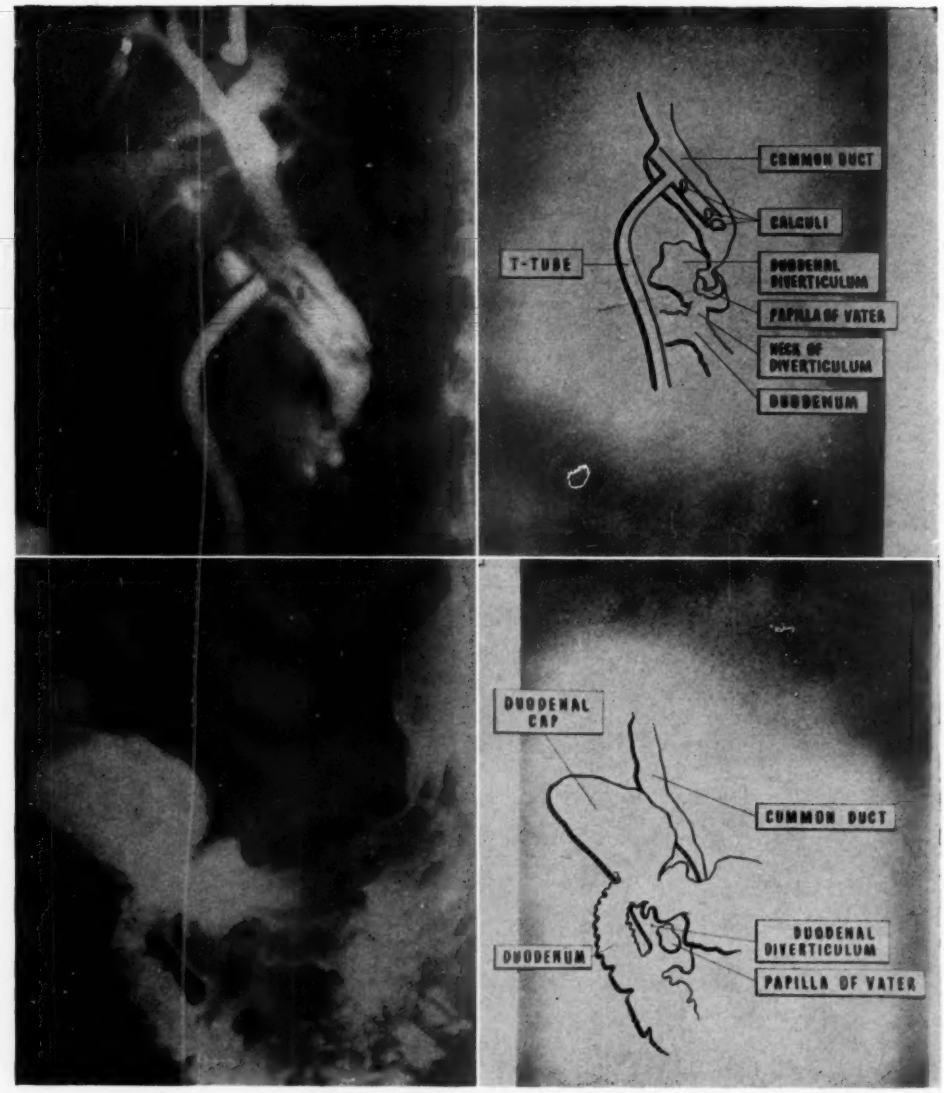


FIG. 7. A and B, case III. There are several large filling defects around the upper branch of the T tube in the common duct and one alongside the short branch of the T tube at the junction with the T.

FIG. 8. A and B, case III. Only one small stone is present along short arm of the T tube; dye enters the duodenum readily.

FIG. 9. A and B, case III. There has been a disappearance of all previous filling defects; dilatation of common duct is somewhat improved.



10A 10B

11A 11B

FIG. 10. A and B, case IV. Cholangiogram demonstrating the common duct entering a duodenal diverticulum; the papilla of Vater is shown. At lesat two of the stones lie in the T tube.

FIG. 11. A and B, case IV. Simultaneous cholangiogram and barium studies of the duodenum. This demonstrates the diverticulum and papilla of Vater. The common duct is shown in its proximal portion; the distal part is hidden by the barium in the stomach.

measured 3.5 by 2 by 2 cm. The postoperative cholangiogram (Fig. 7) revealed a dilated common duct with multiple calculi present.

The common duct was irrigated five times with a total of 5,000 cc. of solution G* during a ten-day period. Following this therapy only one small stone was detected in the common duct and the dye entered the duodenum readily. (Fig. 8.) A cholangiogram four weeks later showed the disappearance of all previous filling defects and the dilatation of the common duct was somewhat improved. (Fig. 9.) The T tube was removed and the patient has since been free of symptoms.

CASE IV. A. R. (No. 25917), a sixty-one year old white female, had a cholecystectomy and choledochostomy performed in August, 1941. She had had a five-year history of intermittent right upper quadrant pain, nausea, vomiting, weight loss and jaundice. The gallbladder was acutely inflamed and stones were found in the gallbladder and common duct.

* Solution G:

Citric acid (monohydrated)	32.25	
Magnesium oxide (anhydrous)	3.84	
Sodium carbonate (anhydrous)	4.37	
Water qs ad	1,000	cc.

The common duct was drained by a T tube for sixteen days.

The patient was well until April, 1944, when she complained of recurrence of symptoms exactly like those occurring prior to cholecystectomy and choledochostomy. She was reoperated upon November, 1944, and the common duct was explored. The choledochus was moderately dilated and contained many stones and sandy material. It was noted at time of surgery that the little finger could easily be inserted into what was believed to be the ampulla of Vater. The common duct again was drained by T tube for twelve days. No cholangiograms were made after either of the first two operations.

The patient was in good health until June, 1948, when evidence of choledocholithiasis (e.g., colicky right upper quadrant pain, chills, fever, jaundice, nausea, vomiting and weight loss) again developed. She was hospitalized and given a three-day flush after the method of Best. Decholin was omitted because she was jaundiced. She did not improve and a choledochostomy was again performed. The common duct measured 1 cm. in diameter and contained many stones measuring from sand to 8 mm. in diameter. These were removed with irrigation and scooping and a T tube was inserted into the duct. A cholangiogram was made at the time of surgery but was unsuccessful. Postoperative cholangiograms using 35 per cent diodrast, however, showed several small stones. Repeated cholangiograms revealed a large collection of dye adjacent to the distal portion of the common duct. (Fig. 10.) A cholangiogram and simultaneous gastrointestinal series revealed this to be a diverticulum of the second portion of the duodenum into which the common duct empties. (Fig. 11.) There was a defect in the opaque medium noted in the diverticulum about the termination of the common duct. It was believed that this represented the papilla of Vater. This case is described in more detail in a subsequent publication.[12]

The patient was reoperated upon in September, 1948, because it was known that stones remained in the common duct. A few days prior to this operation the T tube which had been present since the previous surgery was inadvertently removed. When the incision was made, the stones were found in the sinus tract. The common duct was dilated. It was impossible to make a thorough search for the duodenal diverticulum because of the patient's poor general health, adhesions and distortion of structures from three previous operations. On the fourth postoperative day the T tube was accidentally removed and consequently no postoperative cholangiograms could be obtained. The patient's convalescence was good and the patient is now in good health.

COMMENTS

There are five considerations which experience has emphasized for the successful treatment of choledocholithiasis. They are as follows:

First, choledocholithiasis occurs so frequently. It is not rare but is a common finding in a patient with gallbladder and biliary tract disorders.

The second point is that there are other indications for exploration of the common duct than chills, fever and jaundice. Aspiration of abnormal bile from the common duct has caused us to open and find stones in cases in which there was no other indication of their presence.

Third, congenital anomalies of the bile ducts, although uncommon, nevertheless occur and frequently make surgical procedures more hazardous and difficult. The congenital anomaly in the first case emphasizes this point. This relatively rare anomaly has been described a few times. Leiter[9] described an anomaly similar to it in which the cystic duct entered the right hepatic duct only 5 mm. above a long common duct. Daseler et al. in a study of 500 cadaverous specimens found three instances of the cystic duct entering the right hepatic duct. Anson[1] in a personal communication stated that Hambley believed the anomaly to occur once in 250 to 300 cadaverous specimens, but with duct less deeply cleft than in this case. Kobak and Bettman[8] have reported a case very similar to ours. Embryologically, this might be explained by the primary outgrowth of the cystic duct from the right hepatic duct. Case IV was complicated by the termination of the common duct into

a duodenal diverticulum. This condition has been more fully discussed in another paper.

The fourth consideration is the value of cholangiography. Improvements in the technic of cholangiography[11] at time of surgery have made this a feasible routine procedure which should decrease the incidence of remaining common duct calculi and subsequent operative and non-operative procedures. Postoperative cholangiograms are important to show the thoroughness of removal of stones at surgery and the progress of medical treatment for removal of stones that do remain.

The final point is that there are good medical methods of removing remaining common duct stones. Of these we believe that Best's three-day flush gives the best results. If medical measures fail, it will still be necessary to reoperate and remove the stones.

SUMMARY

1. Four cases are reported which illustrate some of the difficulties encountered in the treatment of choledocholithiasis.

2. In one case an unusual anomaly of the extrahepatic ducts was found; in another the common bile duct terminated in a duodenal diverticulum.

3. Non-operative methods of removal of remaining common duct stones are discussed.

4. Incidence and symptoms of choledocholithiasis and indications for choledochotomy are presented.

5. The factors which make for success in management of common duct stones are emphasized: (1) knowledge of the frequent occurrence of common duct stones; (2) knowledge of the indications for exploration of the common duct; (3) presence of congenital anomalies which affect removal of stones; (4) cholangiography, especially at time of surgery and (5) nonsurgical procedures for the removal of remaining common duct calculi.

Acknowledgment: We wish to thank Mr. Harry Lindstrand for the descriptive drawings and Dr. Fred Carter for the photographic reproductions.

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EARLY POSTOPERATIVE AMBULATION*

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INTEREST in early ambulation has been aroused among surgeons since Leithauser and Bergo's[1] revival of the subject in 1941. Like all new procedures, the pendulum of enthusiasm is apt to swing too far in one direction at first and then too far in the other direction later. But in the course of a few years it settles down to a normal tempo. A great amount of enthusiasm for the procedure has been stimulated in the past several years in civilian practice by the shortage of nursing care and hospital beds.

In an attempt to evaluate the procedure in our general surgical service at Mercy Hospital, the senior author allowed 100 selected private surgical patients to arise on an average of 2.3 days following various surgical procedures. There were eight complications in six patients but no deaths in this series, the results of which are published elsewhere.[2] Since these were selected cases without a control series, we decided to enlarge the series and include an equal number of control cases. During this period the senior author was seized with an acute attack of appendicitis requiring an emergency appendectomy. He arose on the first postoperative day and made personal observations which have assisted him in evaluating the procedure.

This paper is based on 135 early ambulatory patients compared with 135 late ambulatory patients undergoing major surgical procedures of similar magnitude.

Early ambulation is not a new procedure. Dr. Ephraim McDowell[3] who performed the first successful laparotomy in the United States in 1809 found his patient, Mrs. Crawford, up making her bed on the fifth postoperative day. In 1899 Dr. Emil J. Ries[4] of Chicago advocated early ambulation for his gynecologic patients. His patients arose from bed twenty-four hours to six days following vaginal celiotomy. Observations recorded by him compare favorably with those of the present day, especially in relation to bowel habits, appetite, early return of peristaltic sounds and diminished incidence of urinary retention. Early ambulation was not popular in the United States following Ries' article. However, since the late twenties articles have appeared from European clinics stressing its value. The American literature has numerous articles upon the subject since Leithauser's article in 1941.[1,5–12]

There is no common definition for early ambulation at present. Individual standards as to time and physical energy have been set by various investigators. Newburger[5] defines early postoperative ambulation as follows: "A daily postoperative continuation of bodily activities, including walking (not just being placed in a chair), self-care in matters of toilet, dressing, feeding and even actual gymnastics—directed toward an uncomplicated and rapid convalescence."

We have arbitrarily set no later than the third postoperative day as the time limit for arising and actually walking in this series.

PHYSIOLOGY

Normal thoracic motion and pulmonary activity are restored by early ambulation. The normal vital capacity of the lungs is restored and at the same time an increased negative pressure is produced in the large venous vessels in the chest. Lowering of the

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diaphragm also aids in producing an increased negative pressure. This increased negative pressure in the chest augments the return venous flow and should theoretically aid in preventing thrombosis in the extremities. In like manner, full aeration of the lungs and pulmonary motion lessen the possible occurrence of atelectasis.

Skeletal tone is restored early and muscular activity likewise increases the return venous flow.

By early ambulation we hope to maintain a relatively normal vasomotor balance.

CLINICAL OBSERVATIONS

In order to contribute toward the evaluation of this procedure early ambulation was employed in 135 selected patients on our general surgical service at Mercy Hospital and 135 comparable patients were kept non-ambulatory during the early postoperative days. (Tables I and II.) We attempted to maintain constant, as nearly as possible, the type of operation and the age of the patient in our control series so that there was inadvertently a small variation in the sex incidence.

TABLE I

ONE HUNDRED THIRTY-FIVE EARLY AMBULATORY PATIENTS

Types of Cases	Sex		Average Age		Average Day of Ambulation		Temperature Maximum Elevation		Day of Return to Normal	Total Catherizations	Number of Patients with Complications
	Female	Male	Female	Male	Female	Male	Level	Day			
Thyroidectomy	13	..	44.9	....	1.7	...	100.4°F.	1.4	2.8	0	1
Cholecystectomy	10	2	44.5	43.5	2.08	2.5	101.2°F.	1.4	4.5	0	2
Cholecystectomy and appendectomy	3	..	28	....	2.6	...	101.3°F.	1.7	5.6	0	0
Oophorectomy	4	..	33	....	2.7	...	100.9°F.	1.2	4.4	0	0
Appendectomy											
Acute	7	16	24.7	34.8	2.17	2.1	100.5°F.	1.1	4.9	0	1
Interval	19	10	19.9	23.3	2	1.8	100.4°F.	1.9	4.7	3	2
Gastroenterostomy	1	1	53	50	3	3	101.2°F.	2	4	0	0
Hysterectomy	8	..	40.6	....	2.1	...	101°F.	2.1	4.3	2	1
Herniorrhaphy											
Indirect inguinal	3	14	22.7	32.5	2	2.1	100.7°F.	1.5	5.7	1	1
Direct inguinal	..	3	....	68	....	2.3	101°F.	1.3	2.3	0	0
Umbilical	1	..	36	....	3	...	100°F.	1	5	0	0
Incisional	..	2	....	45	....	1.5	100°F.	1	2	0	0
Femoral	1	..	26	....	2	...	101.8°F.	3	6	0	0
Vagotomy											
Transthoracic	..	4	....	44.4	....	2	101.6°F.	1.3	4.7	0	2
Transabdominal	..	1	....	51	....	3	101.2°F.	1	6	0	1
Transabdominal with posterior gastroenterostomy	1	2	47	41	3	3	101.5°F.	1	4.5	0	1
Mastectomy	5	..	61	....	1.2	...	100.7°F.	1	2.7	0	1
Bowel obstruction	..	1	....	34	....	2	101°F.	3	7	1	1
Lumbar sympathectomy	..	1	....	55	....	2	102°F.	2	10	0	1
Pelvic laparotomy	1	..	42	....	1	...	101°F.	1	Left hospital with temperature elevated	0	1
Cholecystectomy and closure of choledochoduodenal fistula	1	..	65	....	2	...	101.8°F.	1	4	0	0
Total or average	78	57	35.5	36.4	2.02	2.1	100.8°F.	1.5	4.53	7	16

In summarizing the two series (Table III) the average day of ambulation was approximately the second postoperative day in the early ambulation cases as compared with almost the ninth postoperative day in the control series. It is of interest to note that the average maximum temperature of the patients was entirely uninfluenced by early ambulation in our two series. We observed, also, that the average maximum temperature elevation occurred during the latter half of the first postoperative day in both series and that the latter half of the fourth postoperative day was the average day of return to normal

TABLE II

ONE HUNDRED THIRTY-FIVE NON-EARLY AMBULATORY PATIENTS

Types of Cases	Sex		Average Age		Average Day of Ambulation		Temperature Maximum Elevation		Day of Return to Normal	Total Catheterizations	Number of Patients with Complications
	Female	Male	Female	Male	Female	Male	Level	Day			
Thyroidectomy	13	..	42.6	....	6.6	....	100.8°F.	1.9	4.2	0	3
Cholecystectomy	10	2	43.9	51.5	12.9	11	101.6°F.	1.7	5.6	2	4
Cholecystectomy and appendectomy	2	1	42.5	54	9	12	100.8°F.	2.3	5.7	0	1
Oophorectomy	4	..	45	....	9	....	100.9°F.	1.5	5.5	0	1
Appendectomy											
Acute	13	10	25.4	21.2	7.4	9.2	100.4°F.	1.8	4.5	3	0
Interval	21	8	21.2	17.9	9.1	7.4	100.4°F.	1.9	4.8	11	4
Gastroenterostomy	1	1	49	34	10	9	100.4°F.	1	4	0	0
Hysterectomy											
Subtotal	8	..	40.3	....	8.1	....	101.1°F.	1.8	4.3	2	0
Herniorrhaphy											
Indirect inguinal	1	16	39	37.6	7	8.8	100.2°F.	1.1	3.5	7	0
Direct inguinal	..	3	....	40	.....	8	100.2°F.	2.3	5	1	0
Umbilical	1	..	40	....	4	....	100.2°F.	2.0	5	0	0
Incisional	2	..	54.5	....	19	....	102.3°F.	3.5	11	0	1
Femoral	..	1	....	62	.....	9	100.0°F.	2.0	3	0	0
Vagotomy											
Transthoracic	..	1	....	39	.....	4	100.8°F.	1	5	0	1
Transabdominal	2	3	39	52.7	8.5	8.7	101.9°F.	1.8	6.2	1	3
Transabdominal with posterior gastroenterostomy	..	2	....	53	.....	6.5	101.6°F.	1.5	7.8	0	1
Mastectomy	5	..	45.8	....	7	....	101.0°F.	3	7.6	3	3
Bowel obstruction	..	1	....	55	.....	20	101.4°F.	4	5	0	0
Lumbar sympathectomy	1	..	23	....	11	....	100.4°F.	2	4	0	0
Pelvic laparotomy	1	..	35	....	8	....	100.6°F.	2	7	2	0
Cholecystojejunostomy	1	..	72	....	Expired 8th postoperative day	....	102.0°F.	7	....	0	1
Total or average	86	49	35.6	34.4	8.8	8.8	100.8°F.	1.85	4.9	32	23

TABLE III

SUMMARY CHART

Total Number of Patients		Average Age	Average Day of Ambulation	Average Maximum Temperature	Day of Maximum Temperature Elevation	Day of Normal Temperature	Total Catheterizations	Number of Patients with Complications
Females	78	35.5	2.02	100.8°F.	1.5	4.53	7	16
Males	57	36.4	2.1					
	135	36.0	2.06					
Non-early Ambulation								
Females	86	35.6	8.8	100.8°F.	1.85	4.9	32	23
Males	49	34.4	8.8					
	135	35.0	8.8					

temperature in both series. It may be noted from the summary chart (Table III) that there is only a minimal favoring of the early ambulation series in this respect. These findings are at variance with the report of Schafer and Dragstedt[8] who observed lowered maximum temperature and earlier return to normal temperature in a series of 103 early ambulatory patients.

There were seven catheterizations in the early ambulatory group as compared with thirty-two in the control series. This finding confirms the observations made by Ries[4] in 1899 and is at variance with findings recorded by Canavarro[10] who found the number of catheterizations equal in his larger series of 401 cases with the same number of controls.

TABLE IV
COMPLICATIONS IN 135 EARLY AMBULATORY PATIENTS

Types of Cases	Atelectasis or Pneumonitis (Postoperative Day)	Pulmonary Embolism (Postoperative Day)	Thrombophlebitis (Postoperative Day)	Phlebothrombosis (Postoperative Day)	Wound Infection (Postoperative Day)	Other Complications (Postoperative Day)
Thyroidectomy						
Female 37 yr....	0	0	0	0	0	Thyroid storm 1st
Cholecystectomy						
Female 52 yr....	0	5th	0	0	0	0
Female 40 yr....	0	0	0	7th	0	0
Appendectomy						
Interval						
Female 21 yr..	0	0	14th	0	0	0
Female 19 yr..	0	0	0	0	5th	0
Acute						
Male 50 yr....	0	0	0	0	11th	0
Hysterectomy						
Female 40 yr....	0	0	0	0	4th	0
Inguinal herniorrhaphy						
Male 6 yr.....	0	0	0	0	5th	0
Vagotomy						
Transthoracic						
Male 52 yr....	2nd	0	0	0	0	0
Male 50 yr....	0	0	0	5th	0	0
Transabdominal						
Male 51 yr....	2nd	0	0	0	0	0
Transabdominal with gastroenterostomy						
Male 25 yr....	2nd	14th	0	0	0	0
Mastectomy						
Female 57 yr....	0	14th	6th	0	0	0
Bowel obstruction						
Male 34 yr.....	0	0	0	0	0	Reaction to penicillin 1st
Lumbar sympathectomy						
Male 55 yr.....	2nd	0	0	0	0	0
Pelvic laparotomy						
Female 42 yr....	0	0	0	0	0	Nausea throughout course in hospital

There were eighteen complications in sixteen patients in the early ambulatory group (Table IV) as compared with forty-four complications in twenty-three patients in the control group (Table V); or 11.9 and 17 per cent, respectively, of the

TABLE V

COMPLICATIONS IN 135 NON-EARLY AMBULATION CASES

Types of Cases	Atelectasis or Pneumonitis (Postoperative Day)	Pulmonary Embolism (Postoperative Day)	Thrombophlebitis (Postoperative Day)	Phlebothrombosis (Postoperative Day)	Wound Infection (Postoperative Day)	Other Complications (Postoperative Day)
Thyroidectomy						
Female 32 yr....	0	0	0	0	0	Pharyngitis 3rd
Female 41 yr....	11th	0	0	0	0	Peripheral neuritis 1st; psychosis 1st
Female 58 yr....	0	0	0	0	0	Cholecystitis 1st; auricular fibrillation; depression 2nd
Cholecystectomy						
Female 49 yr....	2nd	0	0	0	0	0
Female 59 yr....	0	0	0	0	0	Cerebral embolism; expired 2nd
Male 36 yr.....	1st	0	0	0	0	Skin disruption 4th
Female 64 yr....	0	0	0	0	0	Left brachial artery embolus 2nd sknin disruption 3rd
Cholecystectomy and appendectomy						
Male 54 yr.....	0	0	0	0	0	Evisceration 4th
Oophorectomy						
Female 23 yr....	0	0	0	0	10th	0
Appendectomy Interval						
Female 19 yr..	21st	0	0	0	8th	Pharyngitis 14th
Female 27 yr..	0	0	0	0	0	Cystitis 4th
Male 15 yr....	0	0	0	0	5th	0
Male 31 yr....	0	0	0	0	9th	0
Herniorraphy Incisional						
Female 55 yr..	1st	0	0	0	6th	0
Vagotomy Transthoracic						
Female 39 yr..	0	0	0	0	7th	0
Transabdominal						
Male 62 yr....	1st	0	0	0	5th	Auricular fibrillation 3rd and 5th; regional pericarditis 3rd; superficial dehiscence 5th; cardiospasm 7th
Female 44 yr..	13th	12th	12th	0	0	0
Male 37 yr...	0	0	0	0	11th	0
Transabdominal with gastroenterostomy						
Female 60 yr..	0	0	0	0	8th	Cardiac pulmonary congestion and effusion 2nd; wound dehiscence 8th
Mastectomy						
Female 44 yr....	0	0	0	0	4th	Urticaria 9th; pharyngitis 9th; bilateral pleurisy 16th
Female 50 yr....	0	0	0	0	0	Shock 1st
Female 70 yr....	0	0	0	0	6th	Psychosis 1st and 2nd
Cholecystojejunostomy						
Female 70 yr....	7th	0	0	0	0	Expired 8th

patients in these groups had complications. Our statistics, however, indicate that of those patients having complications, the probability is that early ambulatory patients will have approximately only one complication whereas late ambulatory patients will have approximately two complications.

An interesting observation was that there were three cases of pulmonary embolism, two of thrombophlebitis and two of phlebothrombosis in the early ambulatory group as compared with one thrombophlebitis, one pulmonary embolism and no phlebothrombosis in the late ambulatory group. There were no dehiscences, disruptions nor eviscerations and only four wound infections in the early ambulatory group while there were three dehiscences, one disruption, one evisceration and eleven wound infections in the control group. Only one-half as many patients (four) had pulmonary complications of atelectasis or pneumonia in the early rising group as in the late rising group (eight patients). There were no deaths in the early ambulatory group but there were two in the control group, giving 0.73 per cent mortality for the entire two series.

SURGICAL TECHNIC EMPLOYED

All patients in both series were operated upon under general or spinal anesthesia. Sodium pentothal induction has been routinely employed for general anesthesia and curare used as necessary in both series for relaxation. Intratracheal anesthesia was employed for the transthoracic procedures.

The incisions were transrectus, pararectus, transverse and McBurney's in the abdomen, and intercostal in the chest. Standard herniorrhaphy and radical mastectomy incisions were employed.

Catgut suture material was used throughout except for skin closure. Plain No. 0, doubled, continuous, was used for the peritoneum, interrupted No. 1 chromic for the fascia, plain No. 0 for the subcutaneous tissues and interrupted black silk for the skin.

ADVANTAGES OF EARLY AMBULATION

The following advantages are noted in the literature and also were noted from our personal experiences: (1) increased wound healing; (2) reduction of wound infection, dehiscence and evisceration; (3) lowered incidence of nausea, vomiting and abdominal distention; (4) early return of vasomotor balance; (5) earlier return of normal function of bladder and bowel; (6) maintenance of normal muscle tones; (7) psychologic effect on the patient's morale and mental status; (8) acceleration of convalescence and reduction of complications; (9) earlier return of working ability; (10) economic saving to the patient and hospital; and (11) nursing care reduced which is especially desirable in this day of scarcity of nurses.

CONTRAINDICATIONS FOR EARLY AMBULATION

The contraindications for early ambulation are: (1) prolonged bed rest previous to surgery; (2) cardiac insufficiency; (3) recent coronary occlusion; (4) shock; (5) severe anemia; (6) hemorrhage or fear of hemorrhage; (7) suspected presence of thrombi or emboli; (8) suppurative conditions such as peritonitis, pancreatitis and cholangitis; (9) insecure anastomosis, copious tamponade and difficult hernia repair; (10) avitaminosis; (11) hypoproteinemia; and (12) severe abdominal distention.

COMMENTS

At present we believe that good judgment must be exercised and each case individualized. Early ambulation has its merits but in our experience it has not reduced the incidence of pulmonary embolism, phlebothrombosis and thrombophlebitis (three conditions for which early ambulation was strongly advocated in the past few years) as it was earlier hoped it would. There does seem, however, to be an improvement in wound healing and tensile wound strength by early ambulation. This observation is supported experimentally by

the work of Newburger[5] and Kimbarovsky (cited by Leithauser),[7] who demonstrated that activity rather than immobilization in experimental animals increased wound healing, and by the dog experiments of Royster, McCain and Sloan,[13] who reported actual measured tensile strength 5 to 10 per cent stronger in the wounds of the exercised animals than in the control immobilized animals.

Drye[14] has demonstrated by human experiments with intra-abdominal balloons that early ambulation does not increase abdominal tension significantly to be deleterious to the wound and pressures at least five times as high are observed with such common involuntary acts as coughing or vomiting.

There is noted also an appreciable difference in the number of wound infections in the two series, only four being among the early ambulation cases as opposed to eleven among the late rising cases. This might be attributed to better circulation in the wound area, assuming there is less opportunity for a bacterial growth-stimulating medium as a stagnating vascular bed is eliminated.

We allowed only certain patients with indirect inguinal hernias to arise early and no patients with direct hernias when the study began. However, since the report of Blodgett and Beattie,[15] who showed a lower incidence of recurrence of direct hernias in early risers than non-early risers, we have allowed selected patients with direct hernias to arise early, with no recurrences to our knowledge to date.

Our personal experience was an emergency appendectomy for an acute phlegmonous appendicitis. Ambulation was on the first postoperative day and included walking to the bathroom. A great deal of sharp abdominal pain was experienced upon the initial arising. This, however, diminished with each arising. A Scultetus binder was found to be invaluable and has been used on all our early ambulatory patients. While the skeletal tone of the muscles appeared to be well maintained, it was noted that one month and more later fatigue was very pronounced upon the least exertion.

At present we do not ambulate all our patients early. The contraindications, age, type of patient and operative procedure influence our judgment. Most patients have to be urged to arise the first time but from then on many are rather desirous to continue early ambulation. Some patients, however, are reluctant even to attempt the procedure and resist repeated attempts at early arising. If patients do not arise during the first three days, we do not attempt to ambulate them before the eighth to tenth days.

SUMMARY

1. One hundred thirty-five early ambulatory cases from a private general surgical service are compared with 135 similar but late ambulatory cases.

2. Early ambulation is defined as actual walking by at least the third postoperative day. The average was 2.06 days postoperatively in this series.

3. The average day of ambulation for the control group was 8.8 days postoperatively.

4. The average maximum temperature postoperatively was exactly the same in both series, 100.8°F.

5. Very little difference was noted between the two groups as to the time of occurrence of the maximum temperature and the day of return to normal temperature.

6. Only seven catheterizations were required in the early ambulatory group whereas thirty-two catheterizations were required in the control series.

7. Eleven and nine-tenths per cent of the early ambulatory patients and 17 per cent of the late ambulatory patients developed complications but there were more than twice as many individual complications in the late ambulatory group.

8. There were no deaths in the early ambulatory group but two deaths in the control group.

9. Pulmonary embolism, thrombophle-

bitis and phlebothrombosis were more prevalent postoperatively in the early ambulatory group.

10. Wound infections, dehiscences, disruptions and eviscerations were much more prevalent complications in the late ambulatory group.

11. Pulmonary complications such as atelectasis and pneumonia were twice as common (eight to four) in the late ambulatory group.

12. The advantages and contraindications of early ambulation are summarized.

13. The Scultetus binder affords a great amount of comfort, support and feeling of security to the early ambulatory patient.

14. Catgut sutures are not a contraindication to early ambulation.

15. According to this series the main advantages that can be anticipated by employing early ambulation judiciously in selected cases are apparently limited to reduction of the following: number of catheterizations, wound infections, disruptions and eviscerations, and incidence of postoperative complications, including pulmonary complication (but not pulmonary emboli in this series).

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FACTORS IN THE ETIOLOGY AND MANAGEMENT OF POSTOPERATIVE VENTRAL HERNIAS*

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THERE is no dearth of literature concerning the technics for repair of postoperative ventral hernia but relatively little is said of its etiology. However, inasmuch as this complication is man-made, it is theoretically preventable and a presentation of the factors leading to it would appear to be pertinent. This phase of the problem has received little interest when actually it may prove to be more constructive to the patient if a surgeon evaluated his chances of producing a hernia rather than his ability to repair one. Finally, a method of management including pre- and postoperative care will be outlined for a procedure that has been associated with a far higher mortality rate than is generally appreciated.

Although the majority of ventral hernias originate as a result of operations or trauma, spontaneous types such as a Spigel's hernia and a form due to banding of the abdominal muscles do occur.[1] This report will concern itself only with hernias resulting from previous incisions.

The records of all patients with postoperative ventral hernias admitted to the Cook County Hospital between 1943 and 1946 were reviewed. A total of 213 cases was thereby obtained of which 156 patients were re-operated upon because of the hernia. The patients operated upon were subsequently followed up in the outpatient clinic. As is usual in dealing with the indigent these patients do not return after a few months unless they are again having trouble. Even though follow-up questionnaires were sent to all of the patients surgically treated, only thirty-eight of 156 patients responded.

ETIOLOGIC FACTORS

Age. The average age of the 213 patients reviewed was 48.1 years. Only 19 per cent of the patients were under thirty years of age; the fifth decade showed the highest incidence of incisional hernias.

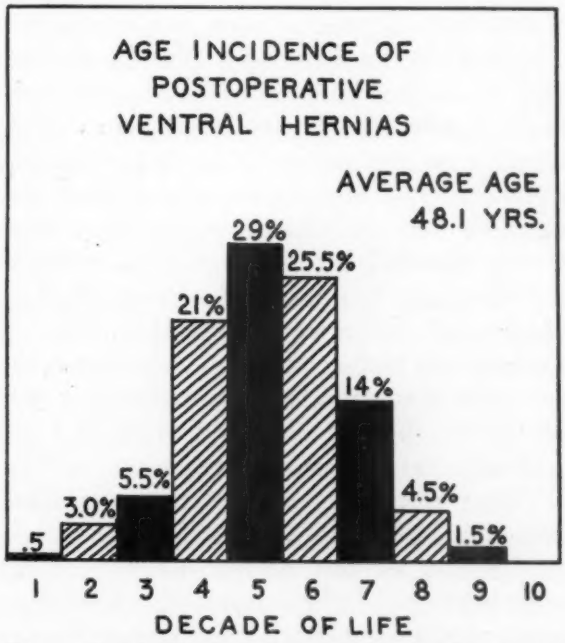

FIG. 1. Graph illustrating age incidence of 213 postoperative ventral hernias; 19 per cent of the patients were under thirty years of age whereas 75 per cent were between the ages of thirty and sixty-nine.

(Fig. 1.) Approximately 90 per cent of these ventral hernias occurred in patients between the ages of thirty and seventy.

Sex. Of approximately 40,000 patients admitted to the surgical services of the Cook County Hospital during the three years covering this study, 58 per cent were males and 42 per cent females. However, 71 per cent of the 213 patients with ventral hernias surveyed were female and 29 per

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cent male which indicates a preponderance of ventral hernia in the female over the male of better than 2:1. Of 300 cases of incisional hernia reported by Branch[2] from the Peter Bent Brigham Hospital, 215 occurred in females and eighty-five in males.

Race. Of the 40,000 surgical admissions during this period, 58 per cent were of the white race and 42 per cent were of the Negro race. With regard to the racial incidence of postoperative hernias 75.5 per cent were white and 24.5 per cent were Negroes, a difference out of proportion to the ratio of admissions.

Obesity. Patients are not routinely weighed upon admission to this institution and so reliance had to be placed upon comment made by the examining physician relative to the patient's weight; this was noted in 131 of the 213 records studied. For matters of convenience weight was arbitrarily divided into four groups, namely, the very obese, moderately obese, slightly obese and the normal and thin. Of 131 patients 29 per cent were very obese, 57 per cent were moderately obese, 9.5 per cent were slightly obese and only 4.5 per cent were normal or underweight.

These patients were further classified according to body weight and anatomic localization of the hernia. Of the group with hernias in the subumbilical midline area, 32 per cent were very obese, 60 per cent were moderately obese, 6.5 per cent were slightly obese and 1.5 per cent were normal or thin. Of the patients with right lower quadrant hernias, 14 per cent were very obese, 62 per cent were moderately obese and 24 per cent were slightly obese. Of patients with right upper quadrant hernias, 40 per cent were very obese, 50 per cent were moderately obese and 10 per cent normal or thin. Thus obesity appeared to play an important role regardless of the anatomic site of the incision. Smith and Mason[3] found that of eighty-four patients having a fascia lata repair of a ventral hernia, twenty-five weighed over 200 pounds. Branch[2] observed that forty-eight of 100 patients in whom incisional hernias developed were obese. Marbury[4] noted that six of his twenty-one patients with postoperative hernias were obese. He believes that obesity acts to increase the amount of fat within the omentum which makes wound closure more difficult and placing the wound under increased tension because the content of the abdomen is increased.

Constitutional Factors. Inquiry was made into the existence of other systemic disorders which might conceivably be related. Hypertension was present in 14.5 per cent of the patients, organic heart disease in 8.5 per cent, syphilis in 3 per cent, diabetes mellitus in 2 per cent, blood dyscrasias and icterus in 2 per cent, cirrhosis in 2 per cent, chronic constipation in 2 per cent and dysuria in 1 per cent. With the possible exception of hypertension and organic heart disease the incidence of these coexisting systemic conditions probably does not exceed the hospital incidence of such diseases significantly.

Inciting Operation. It was possible to determine the nature of the surgical procedure performed in the original operation in 202 of the 213 records reviewed although an accurate pathologic diagnosis was not always determined. (Fig. 4.) For example, one could not differentiate a hysterectomy performed for uterine fibroids from that done for carcinoma of the fundus. In all instances the history of the operation was at least compatible with its anatomic location. Forty-nine patients or 24.4 per cent had had a hysterectomy performed; it was impossible to determine in all instances whether this was total or supracervical. Appendectomies accounted for forty-eight of the previous operations or 23.6 per cent. Recurrent incisional hernias accounted for twenty-one or 10.3 per cent. Cesarian section led to postoperative ventral hernia in twelve or 6 per cent of the patients. Ruptured peptic ulcer, previous umbilical herniorrhaphy and stab wounds accounted for approximately 3 per cent each of the 202 known previous operations. A miscel-

laneous group of cases make up the remaining 15.4 per cent. Forty-five of these patients (22 per cent) had had two or more abdominal operations. It is of interest that operations such as gastric resections and bowel resections accounted for so few ventral hernias.

In the series of 300 postoperative ventral hernias reported by Branch[2] the anatomic distribution was as follows, namely, lower midline incision, 45 per cent; upper right rectus incision, 17 per cent; lower right rectus incision, 16 per cent; McBurney, 15 per cent and miscellaneous, 7 per cent.

We have previously reported a series of more than 5,000 appendectomies from this institution[5] and noted then that the McBurney incision was used in 88 per cent of the appendectomies, the right rectus incision in 11 per cent and the right paramedian incision in 1 per cent. However, of the forty-eight postappendectomy hernias reported here, 48.5 per cent followed the McBurney incision, 37 per cent followed the right rectus incision and 14.5 per cent followed the right paramedian incision.

An attempt was made to correlate the length of time between the inciting operation and the onset of the hernia. An accurate history in this regard was obtained in 111 of 213 patients. Of interest to us was the speed with which most ventral hernias make their presence known for in 84 or 75.5 per cent of this group the ventral hernia was present before one year. Twenty-seven or 24.5 per cent dated the inciting operation as occurring more than a year before; the longest interval noted was twenty-two years. The presence of wound infection complicating the original procedure could be established in twenty-nine or 14 per cent of the 213 patients. Only six or 3 per cent could give a history that a drain was used after the operation. Only one patient volunteered the information that the onset of her hernia was coincident with trauma. Branch[2] reported that forty-nine of his 100 patients with ventral hernia had wound infections, in thirty-three of whom drains were used. Of twenty-one patients reported by Marbury[4] eight showed signs of wound infection.

PREOPERATIVE MANAGEMENT

Reduction by taxis was attempted on all incarcerated postoperative ventral hernias and was successful in eighteen of thirty-three such emergencies; many of these patients subsequently came to operation as elective procedures. Strangulation is associated with such a degree of tenderness that the patient resists the surgeon's efforts to use taxis if he unwittingly attempts to use it in the presence of signs of strangulation. Thirteen or 6.5 per cent of all patients studied required an emergency surgical intervention for relief of obstruction due to incarceration or strangulation. Two patients died before they reached the operating room. In private practice this type of situation infrequently occurs for the patient will usually present himself with an obvious hernia as soon as it is noticed, if the surgeon had not already recognized it during his postoperative follow-up period.

Reduction of weight is an important part of the preparation if the patient is at all cooperative. Our statistics indicated that approximately 95 per cent of these patients weighed more than they should and if obesity is a factor in producing the original hernia, it can be reasonably expected to influence the chance for recurrence. Depending upon the metabolic needs of the patient, the use of diets between 800 and 1,200 calories resulted in appreciable weight reduction within a few months; such diets should include an optimal amount of protein and water soluble vitamins because of the acknowledged role of both these factors in wound healing.

Protein deficiency is rarely a problem with these patients for most of them eat more than they should, including protein. However, the patient upon whom the original operation was done for a malignancy may well prove to be the exception and in such individuals determination of total serum proteins and serum albumin should be carried out. Even if these values

are within normal limits, if clinical evidence of anorexia, weight loss, edema or diarrhea is present, intensive measures for the correction of the protein depletion should be instituted before rather than after an operation. This can be accomplished by a variety of routes and measures such as we have previously reported.[6,7]

Vitamin deficiencies are usually subclinical and methods for recognizing them are inadequate. Despite the well nourished appearance of this type of patient it is well to fortify them with oral concentrates of vitamins B and C. That both of these elements are of major importance in wound healing has been confirmed by many.

Dehydration may occur in a patient with an incarcerated hernia who presents the clinical picture of obstruction and this must be rectified before the patient is operated upon electively or at least instituted simultaneously with the emergency operation. In the presence of strangulation there will be need for plasma or blood to manage the surgical shock that is impending if not already present.

Treatment of associated diseases must be brought up to date before embarking upon the operation. The high incidence of hypertension and organic heart disease in this group of patients has been mentioned. Other conditions which may require the cooperative efforts of consultants include diabetes, prostatic obstruction and a host of other illnesses which occur in these patients with average frequency. The correction of a cough, particularly one associated with a chronic bronchitis or bronchiectasis, before surgical intervention can do much to assure a permanent result. Discouragement of smoking before operation, particularly in those patients in whom a chronic pharyngitis develops from it, is thought to minimize postoperative coughing in patients who are given an inhalant anesthetic.

Binders for the reduction of huge ventral hernias have been recommended as a preoperative measure in adjusting the effect of increased intra-abdominal tension that will be produced on the diaphragm, venous circulation and biliary tract.

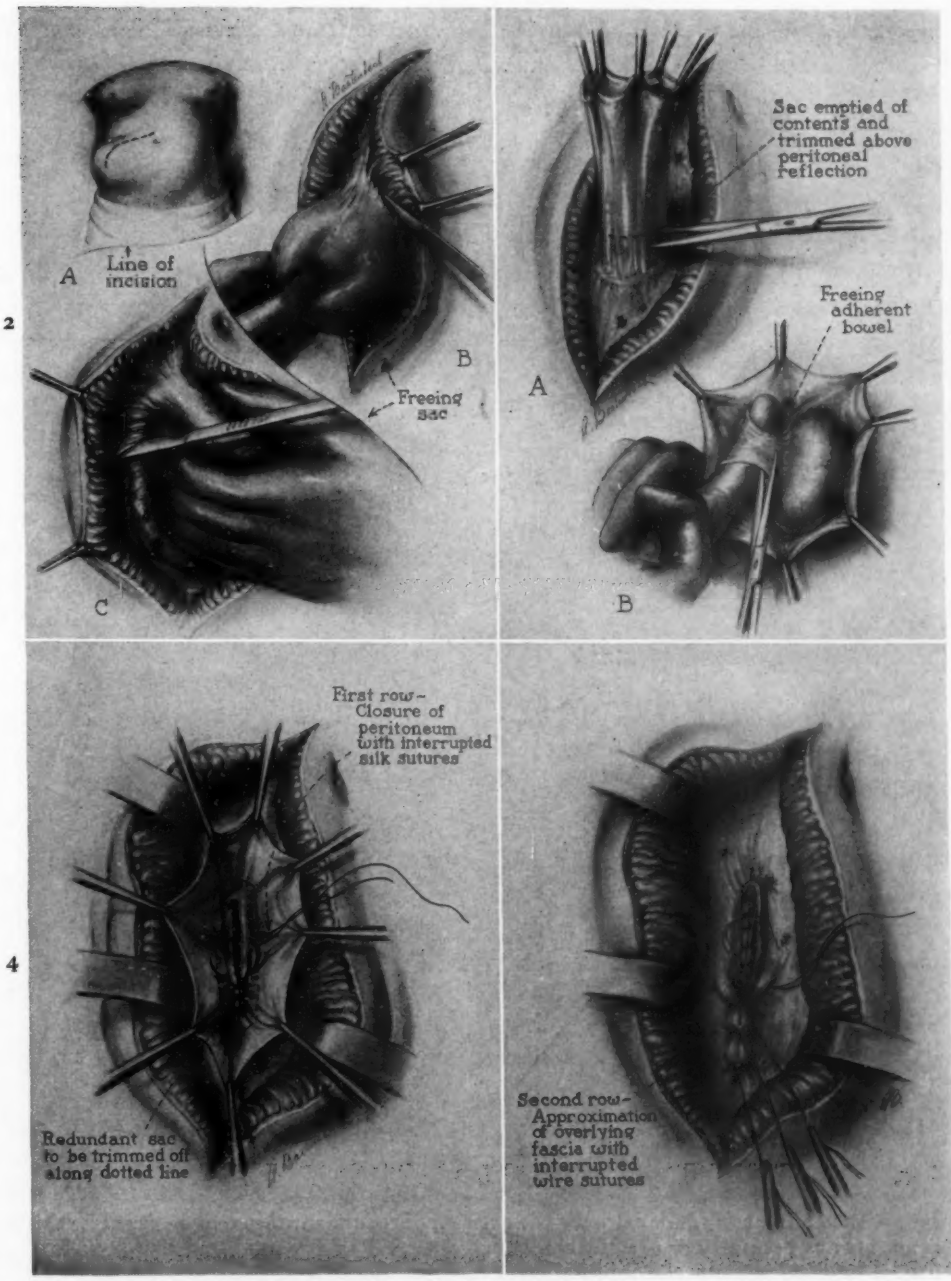
Cleansing enemas before operation are important in preventing postoperative distention and straining at stool. Both of these situations tend to increase intra-abdominal tension with resultant strain on the freshly repaired wound. Avoidance of bowel movement for several days postoperatively would appear to be desirable.

Cleansing of the skin will be important here for the effect of a large protruding hernial mass in an obese patient produces maceration and excoriation of the skin. Cleansing with soap and water under sterile conditions after shaving is a more practical way of minimizing the chances of infection from this source than is the reliance upon surface antiseptics.

Intragastric suction should be instituted before the patient is sent to the operating room. This will prevent aspiration, obviate the effect of vomiting in increasing intra-abdominal pressure, prevent intestinal distention and by retarding gastric dilatation, it will allow the diaphragm a greater degree of excursion.

OPERATIVE MANAGEMENT

The literature is replete with descriptions of technics for the surgical repair of ventral hernia. We will make no attempt to evaluate these. We have encouraged our staff to rely upon the edict of McNealy and Lichtenstein[8] in "suturing like to like." Accordingly, we have relied upon tissues present within the wound without resorting to fascial grafts,[9] cutis grafts,[10] beef fascia transplants[11] or metallic inserts.[12] The technic as developed by one of us (K. A. M.) for the usual incisional hernia is illustrated. (Figs. 2 to 9.) When the hernial defect is large and one has reason to suspect adherent content such as the omentum and bowel, an intraperitoneal procedure is used. (Figs. 3 to 8.) When a small and easily reducible hernia with an empty sac is present, the technic used in inverting a direct hernia can be used in which the sac is not opened but inverted as shown in


A
Line of incision
B
Freeing sac
C
Sac emptied of contents and trimmed above peritoneal reflection
Freeing adherent bowel
A
B
First row—Closure of peritoneum with interrupted silk sutures
Redundant sac to be trimmed off along dotted line
Second row—Approximation of overlying fascia with interrupted wire sutures

2 3 4 5

FIG. 2. Choice of incision in the repair of postoperative ventral hernia; this will be frequently influenced by the desire of the surgeon to remove the previous scar. Exposure of the hernial sac by sharp dissection down to the anterior rectus fascia is shown in inserts B and C.

FIG. 3. The hernial sac is opened and emptied of its contents, adhesions of adherent structures being divided between forceps as is shown in insert B. It is important that the peritoneum of the sac not be trimmed closer than 1 inch to the internal ring to permit peritoneal closure without tension.

FIG. 4. The peritoneal opening is closed with a series of interrupted silk sutures; other permanent suture material is equally satisfactory.

FIG. 5. Second row of stainless steel wire sutures so placed to invert the cut edges of the peritoneum and fascia.

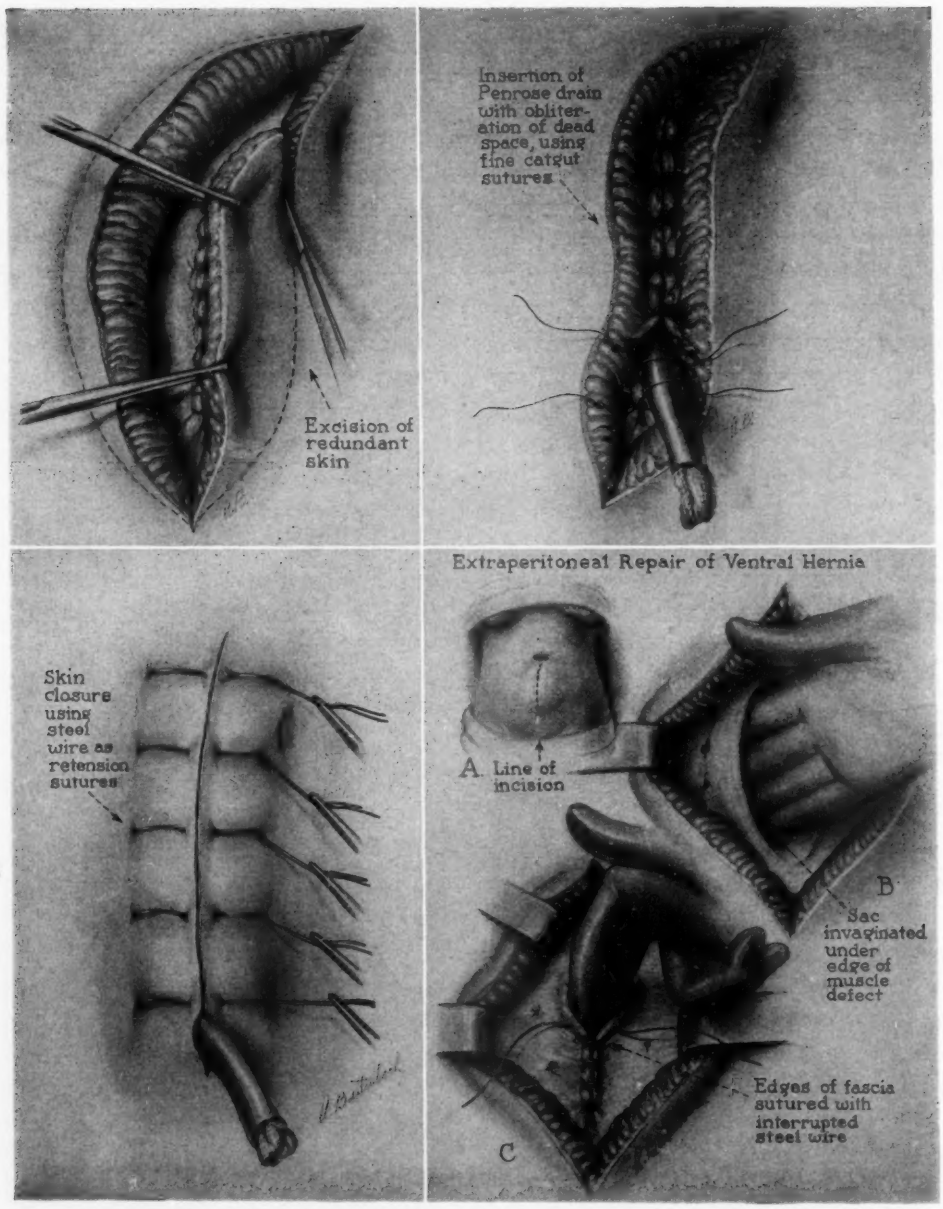

6
Excision of redundant skin
Insertion of Penrose drain with obliteration of dead space, using fine catgut sutures
7
Skin closure using steel wire as retension sutures
8
Extraperitoneal Repair of Ventral Hernia
A Line of incision
B
Sac invaginated under edge of muscle defect
Edges of fascia sutured with interrupted steel wire
C
9

FIG. 6. In pendulous abdominal walls the excision of redundant skin may be feasible; this is not always necessary or practicable.

FIG. 7. In obese patients the obliteration of excessive dead space must be provided for as well as drainage for accumulated serum; in less obese patients this need not be required.

FIG. 8. Skin closure in obese patients can be accomplished with stainless steel wire used as retention sutures. In the event of infection these sutures are well tolerated.

FIG. 9. Method of extraperitoneal repair of a small and easily reduceable postoperative hernia; the inversion of the fascial edges is accomplished with interrupted stainless steel wire sutures.

Figure 9. We do believe, however, that the following surgical principles are important.

Anesthesia must be of a type which promotes the greatest degree of relaxation; the agent which will achieve this result will vary with one who is administering it and there is no doubt but that the same result can be obtained by different methods. In our experience, however, it has been found that spinal anesthesia accomplishes the most for this procedure. The use of curare by an anesthesiologist, combined with endotracheal anesthesia to control diaphragmatic breathing, would probably be just as suitable if such service is available.

Permanent suture material has much to offer the surgeon in the repair of ventral hernia. The decreased incidence of wound infections and wound drainage and the increased wound strength are now commonly accepted. Our own preference has been to use fine silk in the peritoneal closure and stainless steel wire in the fascia. Parsons[13] reported that the incidence of recurrence of inguinal hernia has been four times as great in wounds closed with catgut as in those repaired with silk. Undoubtedly the use of other permanent sutures such as cotton will serve as well.

Interrupted sutures are of paramount importance for these wounds are subjected to unusual tension and a division of holding strength between as many strands and knots as possible can only prove to be to the patient's advantage.

Rubber drains are recommended for the closure of large subcutaneous defects because subcutaneous tissue fat tolerates infection poorly and an accumulation of blood, serum or an abscess can lead to a breakdown of the repair and a recurrence. (Fig. 7.)

Hemostasis must be thorough for we believe that hematoma in a wound acts as a fine medium for the development of wound infection. The use of absorbable hemostatic sponges may offer some assistance here.

POSTOPERATIVE MANAGEMENT

Intragastric suction should be instituted before the patient is sent to the operating room and continued postoperatively until bowel sounds return or until the patient passes flatus. The advantages of intestinal suction have been already stated. If these patients are encouraged to drink with the tube in place, patency of the suction tube is facilitated, the tube is better tolerated and the danger of parotitis is minimized.

Parenteral fluids will become necessary during the period of suction siphonage, ordinarily not over the first three postoperative days. Usually 3,000 cc. per day will be sufficient to insure an adequate urinary output. No additional chlorides should be administered other than that aspirated through suction in excess of the oral intake. The bulk of this parenteral fluid, then should be dextrose in distilled water, utilizing amino acids when nutritional problems exist. In addition, the crystalline vitamins B and C can now be administered with the intravenous fluids.

Catherization of the urinary bladder requires detailed attention, particularly in large infra-umbilical midline hernias. Distention at the site of hernia repair is deleterious as is straining in an effort to void spontaneously. An inlying Foley type of catheter can be excellently managed in the more difficult cases.

Colon tubes or dilatation of the rectal sphincter will frequently expedite the passage of flatus. Colon tubes are best used intermittently for short intervals if development of hemorrhoids is to be avoided. After operation enemas are to be deferred for three to four days and then should be preferably mild, such as an oil retention enema, followed by warm tap water. Constipation should be avoided during the immediate postoperative period and for this purpose small quantities of mineral oil per mouth are desirable.

Binders of the scultetus type seem to make these patients more comfortable and the wound less painful. They will facilitate

coughing and expectoration, for the wound will be splinted, as well as aid in early ambulation. After discharge from the hospital the patient is advised to wear nothing more than her usual garments. We have not recognized any advantage from the use of surgical corsets.

Oxygen can be profitably administered to the patient who has a respiratory difficulty from the sudden readjustment of the diaphragm following repair of a large ventral hernia. In addition, oxygen has some theoretical advantage in prevention of intestinal distention. The use of mixtures of oxygen and carbon dioxide as a regimen of hyperventilation is of merit, particularly in the obese patient in whom pulmonary complications postoperatively are so prone to develop.

Early ambulation can be used in hernias repaired with permanent interrupted sutures for the wound is as strong on the first as on the tenth day. The advantages of this program are manifold[14] but here in particular it would favor a lower incidence of atelectasis, thromboembolic phenomena, earlier return of bowel function and it leads to better wound healing.

Antibiotic therapy will be optional. The hope that it will decrease the incidence of wound infection will probably not materialize. More often it will be directed toward pulmonary complications to which this group of patients is predisposed.

Anticoagulant therapy for this type of patient has more than just theoretical evidence in its support. These patients have been shown to be predominantly obese and it has been found that in obese patients thromboembolic diseases develop more often than others. Because such therapy can be used prophylactically, the speed with which coagulation tendencies are controlled is less important and reliance upon dicumarol® alone will be sufficient. This, of course, must be controlled by reliably performed prothrombin times.

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COMPLICATIONS

To illustrate the advantage of a standardized technic in the management of a surgical procedure we will compare two series of patients operated upon. There were 156 patients operated upon by various surgical services of a charity institution in which the choice of technics, sutures and ability of the operator varied; there was a smaller series of forty private patients operated upon by one of us (K. A. M.) in whom all the operative principles previously outlined were carefully adhered to.

Of the 156 ward patients operated upon there were seven deaths, a mortality of 4.7 per cent. Four of the deaths occurred as emergency procedures; the mortality rate for emergency procedures was 31 per cent as compared to 2.1 per cent of patients operated upon electively. Postoperative wound infections occurred in forty-eight of the 156 patients, an incidence of 31 per cent; the incidence of wound infections in patients with two or more previous operations averaged 48 per cent. The longest follow-up period that is statistically adequate in numbers was one year; 17.3 per cent of the 156 patients demonstrated a recurrence of their hernia within that year.

There were no hospital deaths among the forty private patients. Complications in this group consisted of two wound infections and two recurrences of the hernias. This decidedly improved record for private patients we attribute to the fact that only one patient entered emergently, the incidence of obesity was less (58 per cent), a decreased incidence of coexistent diseases and a more experienced operator.

SUMMARY

From a survey of the records of 213 patients with postoperative ventral hernia we have been able to correlate the following etiologic factors. These hernias occur more often in the female than the male and more often in the white than the Negro race. Of this series of patients 95 per cent

were overweight. The initial surgical procedure leading to the hernia was in the following order of frequency, namely, abdominal hysterectomy, appendectomy, recurrent incisional hernias, cholecystectomy, cesarean section, perforated peptic ulcer, umbilical herniorrhaphy and stab wounds. Vertical appendectomy incisions were followed by a relatively higher incidence of herniation.

A detailed program of management of the patient with a postoperative hernia is given in the effort to lower an unduly high mortality rate and morbidity as seen in a charity hospital.

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INGUINAL HERNIORRHAPHY

METHODS OF REPAIR IN USE AT THE PRESENT TIME

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IN order to obtain some idea of the methods of repair of inguinal hernia in use at the present time questionnaires were sent to chiefs of the surgical services of the 418 hospitals approved for surgical residencies as listed in the *Journal of the American Medical Association*, August 16, 1947. Of the questionnaires returned, 236 gave definite replies that were sufficiently clear to be included in this survey.

The basic types of inguinal hernia repair are herein described as the Bassini, the Halsted 1, the Ferguson or Halsted 2 and the Lotheissen, McVay or Cooper's ligament herniorrhaphy.

The Bassini Method. The main steps of the Bassini method of repair consist of[16] (Figs. 1 and 2) complete removal of the hernial sac, suturing of the three-fold muscular aponeurotic layer (the internal oblique muscle, the transversus abdominis muscle and the transversalis fascia) to the shelving edge of Poupart's ligament behind the spermatic cord and the closure of the aponeurosis of the external oblique muscle anterior to the cord. Bassini recommended when suturing the three-fold muscular aponeurotic layer to Poupart's ligament that the first two sutures be placed close to the os pubis and that they should include the lateral edge of the sheath of the rectus abdominis muscle.

The Bassini herniorrhaphy indicates that the spermatic cord is transplanted between the internal oblique muscle and the aponeurosis of the external oblique muscle.

Halsted 1.[16] In the Halsted 1 type of repair the hernial sac is removed and the peritoneum closed with quilted sutures. (Fig. 3.) Originally the spermatic cord was greatly reduced in size by excision of the fascia and veins; this step is no longer practiced in the original manner. The vas deferens and the remaining vessels are brought out through the abdominal wall and left beneath the superficial fascia. Halsted originally closed all of the muscular aponeurotic layers of the abdominal wall with one layer of mattress sutures. In the modern Halsted 1 herniorrhaphy all of the muscular aponeurotic layers are closed posterior to the spermatic cord, but in layers.

The Halsted 1 type of repair of inguinal hernia means that the spermatic cord is transplanted between the superficial fascia and the aponeurosis of the external oblique muscle.

Ferguson or Halsted 2.[16] The Ferguson or Halsted 2 type of repair consists of (Fig. 4) removal of the hernial sac; the spermatic cord is left in its natural position. Then the defect in the transversalis fascia around the internal (abdominal) inguinal ring is sutured up and the cremasteric muscle and fascia are sutured to the internal oblique muscle. The internal oblique and transversus muscles are sutured to Poupart's ligament. The aponeurosis of the external oblique muscle is then closed.

The Ferguson, or Halsted 2, inguinal herniorrhaphy indicates that the spermatic cord is not transplanted and that all of the muscular aponeurotic layers are sutured anterior to the cord.

Lotheissen.[11] (Fig. 5.) In 1898 Lotheissen wrote: "In May, 1897, I intended to perform a Bassini type of repair on a

45 year old woman with a recurrent inguinal hernia, the patient having had two previous operations elsewhere. During the excision of the scar I had to remove part of Poupart's ligament, rendering a typical Bassini repair impossible. I sewed the muscles to the periosteum of the horizontal part of the pubic bone, the so-called Cooper's ligament; this was performed surprisingly easy. Since the result was good I decided to use this type of procedure, in the future, in the operative treatment of femoral hernia. . . . If an inguinal hernia is also present one isolates the hernia sac and disposes of it as recommended by Bassini. . . . We have used this procedure in 12 cases." Thus Lotheissen devised his operation mainly for the treatment of femoral hernia. It remained for other workers[2–5, 14, 17] and especially McVay[13] to popularize the utilization of Cooper's ligament in the repair of inguinal hernia.

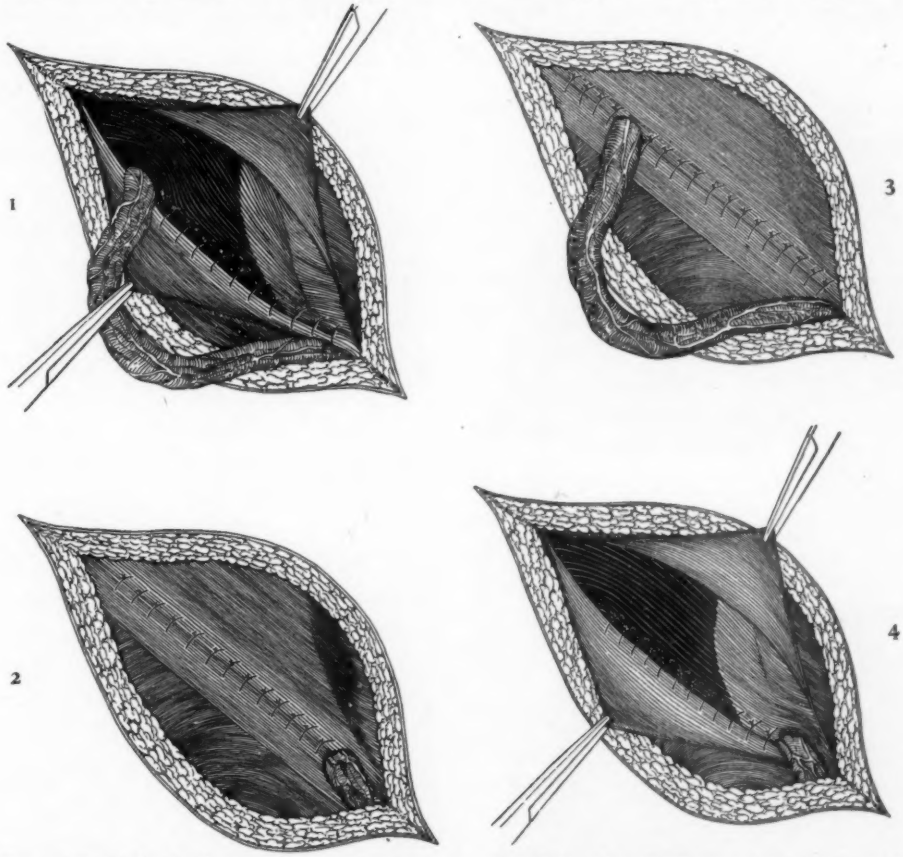
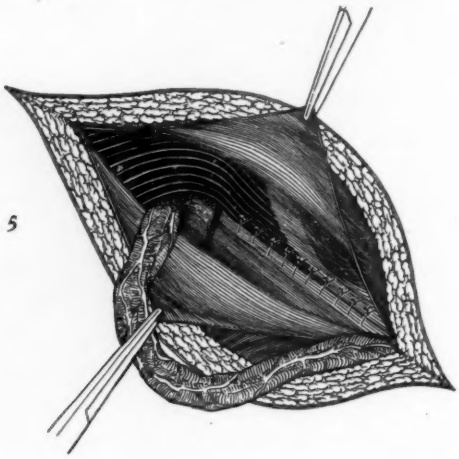


FIG. 1. Bassini; the hernial sac has been removed and the threefold muscular-aponeurotic layer has been sutured to Poupart's ligament posterior to the spermatic cord.
FIG. 2. Bassini; the external oblique aponeurosis has been closed anterior to the cord.
FIG. 3. Halsted 1; the hernial sac has been removed and all of the inguinal layers have been sutured posterior to the cord. The spermatic cord is transplanted directly beneath the superficial fascia.
FIG. 4. Ferguson or Halsted 2; the hernial sac has been removed, the transversalis fascia sutured up and the threefold muscular-aponeurotic layer has been sutured to Poupart's ligament anterior to the spermatic cord. The cord is not transplanted.

Examination of the bony pelvis reveals a sharp ridge along the superior border of the superior ramus of the pubic bone extending from the pubic tubercle to the iliopectineal eminence. (Fig. 7.) On this ridge is located the fascial condensation known as Cooper's ligament (also called the iliopectineal ligament, the pectineal ligament, the pubic ligament and the superior pubic ligament). When one looks directly downward into the superior aperture of the lesser pelvis, Cooper's ligament

will be seen to deviate posteromedially from Poupart's ligament. Viewing the pelvis from the front on a plane parallel to that of the superior aperture of the lesser pelvis, a large space will be noted between Poupart's ligament and Cooper's ligament. (Fig. 8.) The suturing of the muscular aponeurotic inguinal layers to Cooper's ligament not only diverts them from the direction of pull of the abdominal muscles, to an increasing degree the further one progresses along Cooper's ligament, but also would require a great deal more tension unless one uses extensive relaxation incisions.

Valuable Contributions to Repair of Inguinal Hernia. There have been a few valuable contributions to the basic types of inguinal herniorrhaphies. Andrews'[1] imbrication of the leaves of the aponeurosis of the external oblique muscle (Fig. 6) involves the transplantation of the cord between the overlapping layers of the aponeurosis of the external oblique muscle. There are several ways in which the leaves may be overlapped, any of which is popu-



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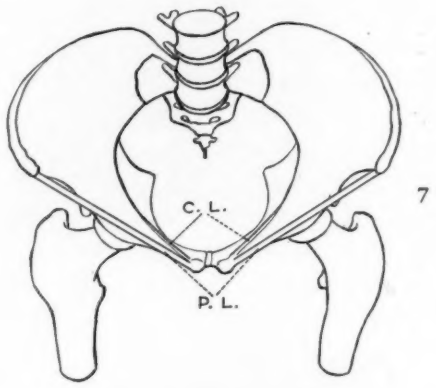

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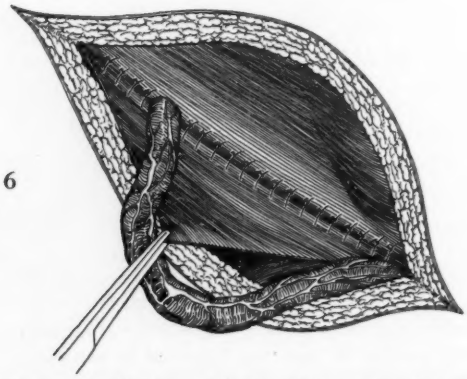

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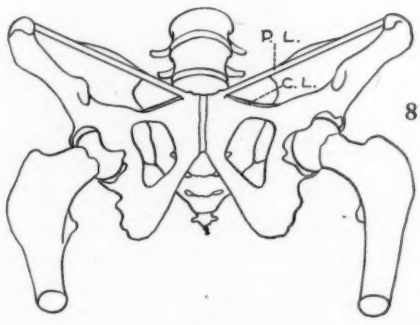

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FIG. 5. Lotheissen; the hernial sac has been removed and the threefold muscular-aponeurotic layer has been sutured to Cooper's ligament.

FIG. 6. Andrews' imbrication; the hernial sac has been removed, the threefold muscular-aponeurotic layer and the upper (medial) leaf of the external oblique aponeurosis have been sutured to Poupart's ligament. The lower (lateral) leaf of the external oblique aponeurosis is lapped over the spermatic cord and sutured to the upper leaf.

FIG. 7. View of the bony pelvis from above and perpendicular to the superior aperture of the lesser pelvis shows the posteromedial deviation of Cooper's ligament. C. L., Cooper's ligament; P. L., Poupart's ligament.

FIG. 8. View of the bony pelvis from the front and on a plane parallel to that of the superior aperture of the lesser pelvis shows the large space between Poupart's and Cooper's ligaments.

larly known as the Andrews' imbrication method.

McArthur's autoplastic suture[12] (Fig. 9) wherein strips are cut from the edges of the leaves of the external oblique aponeurosis, being left attached at the pubic tubercle and used to suture the inguinal layers together, has a few exponents at the present time.

Relaxation incisions in the anterior sheath of the rectus muscle, placed beneath the external oblique aponeurosis, as advocated by Halsted,[16] Rienhoff,[15] and Fallis,[6] have been generally adopted in order to allow the approximation of the inguinal layers with a minimum degree of tension.

The method of utilizing a flap taken from the anterior sheath of the rectus muscle (Fig. 10), as mentioned by Halsted,[16] is routinely used in repair of inguinal hernia by a few surgeons at the present time.

Free fascia lata transplants[9] and free fascia lata sutures[7] are commonly used in the repair of large and recurrent inguinal hernia. Wangensteen's method of employing the iliotibial tract of the fascia lata as a pedicle flap to cover large hernial defects is of occasional value.[18]

Another very valuable contribution to repair of inguinal hernia is the method for converting a direct hernial sac into an indirect one as recommended by Hoguet.[8]

The LaRoque approach[10] to the hernial sac is useful in the repair of certain types of inguinal hernia. The usual inguinal incision is made. If the free (inguinal) edges of the abdominal muscles are lax enough, they are retracted superiorly and the abdominal cavity is entered above the level of the abdominal inguinal ring. If the muscles cannot be retracted sufficiently, a transverse incision through the internal oblique and transversus muscles 1 to 2 inches above their inferior border is made and the abdomen entered. The finger is then introduced through this transverse incision into the abdomen and then into the hernial sac. The hernial sac is dissected free from the spermatic cord and is inverted into the abdomen and dealt with from that position. The transverse incision is closed and the repair of the inguinal region is performed according to the desires of the operator.

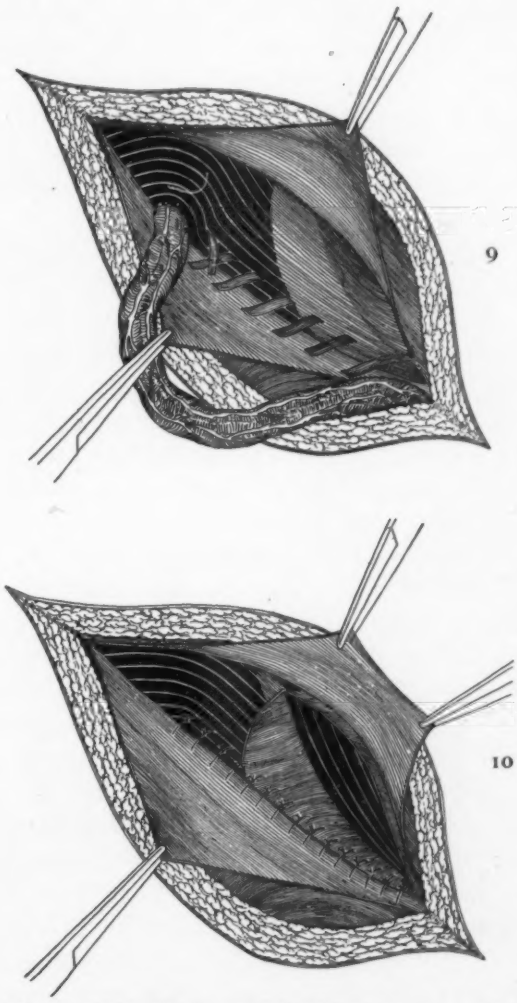

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FIG. 9. McArthur's autoplastic sutures; a strip ⅛ to ¼ inch wide has been cut from the free edge of the upper leaf of the external oblique aponeurosis, being left attached at the pubic tubercle. This strip is used to suture the threefold muscular-aponeurotic layer to Poupart's ligament. In the Bassini type of repair a similar strip cut from the lower leaf of the external oblique aponeurosis is used to close the external oblique aponeurosis.

FIG. 10. Halstead flap of rectus abdominis sheath; after the aponeurosis of the external oblique muscle has been dissected up, a flap is taken from the remaining parts of the anterior sheath of the rectus abdominis. This flap is reflected laterally and is sutured to Poupart's ligament. A much more popular procedure is simply to make an incision in this part of the sheath of the rectus abdominis muscle, the relaxation incision of Halsted.

RESULTS OF THE SURVEY

In tabulating the results of the questionnaires only the first preference of the surgeon is recorded herein. If the cord is transplanted external to the aponeurosis of the external oblique muscle, the operation is classified as Halsted 1. The surgeon may incorporate other features in the repair such as McArthur's autoplastic sutures or/and Andrews' imbrication. Each surgeon has his own special modifications that cannot be listed here.

Regarding the simple indirect inguinal hernia, the type of operation and number of surgeons employing the operation are as follows: Bassini, ninety-nine; Halsted 1, thirty-seven; Ferguson, sixty and Lotheissen, forty. Two of these surgeons incorporate McArthur's autoplastic sutures in their repair, ten Andrews' imbrication and one free fascia lata sutures.

Regarding the large indirect and direct inguinal hernia, the type of operation and number of surgeons employing the operation are as follows: Bassini, ninety-seven; Halsted 1, fifty-one; Ferguson, thirty-one and Lotheissen, fifty-six. Six surgeons employ McArthur's autoplastic sutures, eleven Andrews' imbrication principle and two the LaRoque approach to the hernial sax; eleven use fascia lata sutures or transplants.

The type of operation for recurrent inguinal hernia and the number of surgeons employing the operation are as follows: Bassini, eighty-three; Halsted 1, fifty-nine; Ferguson, thirty and Lotheissen, sixty. Five of these surgeons incorporate McArthur's autoplastic sutures in their technic, eleven Andrews' imbrication principle, two the LaRoque technic and twenty-two free fascia lata transplants or sutures.

SUMMARY

A survey of the methods of repair of inguinal hernia in use at the present time has been carried out. The basic types of repair and the important contributions to inguinal herniorrhaphy are briefly described. The most prevalent type of operation for inguinal hernia is the Bassini principle. The Lotheissen principle of utilization of Cooper's ligament instead of Poupart's ligament has recently increased in popularity.

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PRIMARY CARCINOMA OF THE LIVER*

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PRIMARY carcinoma of the liver is a comparatively rare condition which is not encountered with any degree of frequency in the personal experience of the average clinician. This fact lends interest to a survey of a large series.

The records of the Veterans Administration Hospital at Hines, Illinois, disclose thirty-four instances of primary carcinoma of the liver encountered at necropsy during a period of fourteen years. A study has been made to determine the pathologic anatomy of these tumors and the frequency with which they have occurred.

Pathology. A review of the histologic structure of the tumors included in this study discloses three definite and distinct types, namely, (1) the malignant hepatoma or liver-cord-cell carcinoma, (2) the duct-cell carcinoma or cholangioma and (3) the multiple hemorrhagic malignant hepatoma. The malignant hepatoma or liver-cord-cell carcinoma is by far the most frequent in occurrence. It was encountered twenty-five times or 73.5 per cent in the thirty-four patients with primary hepatic carcinoma comprising this series. The histologic picture is that of cords and nests of large cells resembling the liver-cord cells and often attempting to reduplicate liver cords. In some cases there was a larger circumscribed tumor mass with multiple tumor satellites. These probably represent thrombi in the portal and hepatic veins. In the majority of instances no solitary, large, circumscribed tumor was noted but the entire lobe or lobes were involved with multiple circumscribed nodules of various sizes. (Figs. 1 to 4.)

The duct-cell carcinoma or cholangioma is composed of cuboidal or cylindrical cells in definite alveolar arrangement imitating bile-duct formation. This type of tumor

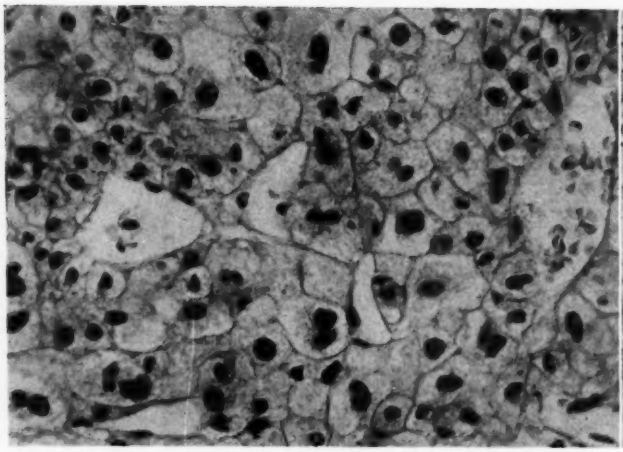
FIG. 1. Gross photograph of primary liver-cord hepatoma; note encapsulation; this involved the left lobe and was resected surgically. Microscopically venous thrombi were found. Patient lived only a few months; autopsy showed generalized liver involvement.

develops a definite fibrous stroma differing in this way from the liver-cord type of hepatic carcinoma which has little stroma. There were seven duct-cell carcinomas (20 per cent) in the thirty-four cases studied. (Fig. 5.)

The multiple hemorrhagic malignant hepatoma occurred twice in thirty-four cases of primary hepatic carcinomas. This tumor is composed of large cuboidal and polyhedral cells surrounding blood channels in a peritheliomatous fashion. These cells tend to imitate the liver-cord cells and bear a relationship to the blood channels which is frequently noted in hypernephroid carcinomas. L'Esperance according to Ewing described these as a pseudosarcoma and notes that they show a gross structure similar to metastatic chorio-epithelioma. (Figs. 6 and 7.)

Metastases. It is generally concluded that while intrahepatic metastases occur quite regularly in primary carcinoma of the

* From the Departments of Pathology of Hines Hospital and Northwestern University Medical School, Hines, Ill. Published with permission of the Chief Medical Director, Department of Medicine and Surgery, Veterans Administration, who assumes no responsibility for the opinions expressed or the conclusions drawn by the authors.



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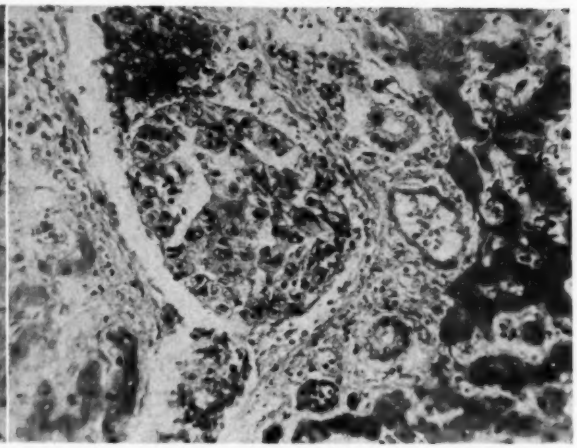

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FIG. 2. Microscopic section of tumor shown in Figure 1 showing typical liver-cord tumor. × 350.
FIG. 3. Tumor thrombus in portal vein in Figure 1. × 300.

FIG. 4. Multiple gross tumor nodules seen in duct-cell carcinoma or cholangioma.

FIG. 6. Photograph of multiple hemorrhagic malignant hepatoma; note large circumscribed hemorrhagic nodules.

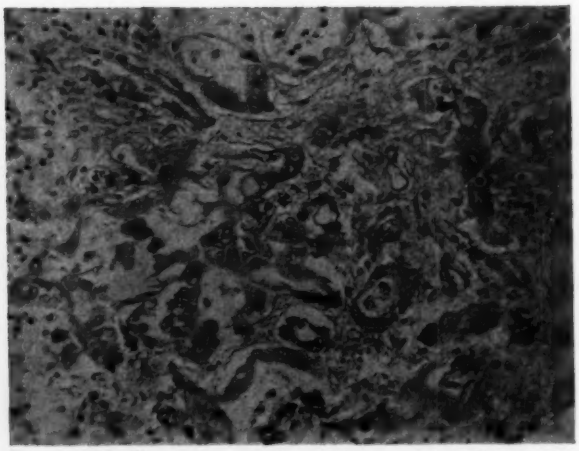

FIG. 5. Medium power photomicrograph of duct-cell carcinoma or cholangioma; the structures imitate the biliary ducts. × 350.

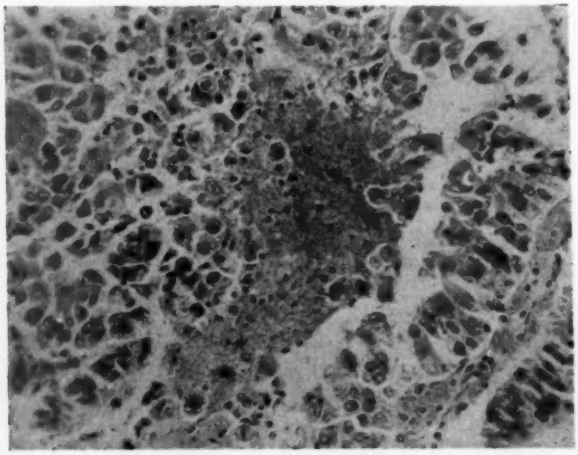

FIG. 7. Microscopic section through hemorrhagic nodule in Figure 6; note vascular channel lined with tumor cells. × 300.

liver, distant metastases are not frequent. Thus in a series of thirty-four cases we found metastases as follows: in twenty-five cases of malignant hepatomas metastases to regional lymph nodes were present in six and distant metastases in seven, four instances of embolic metastasis to the pulmonary vein, one to the spine and two cases of massive thromboses of the portal vein. Of seven duct-cell carcinomas six showed metastases, two to regional lymph nodes, one to the spine, one thrombotic metastases to the lungs, one to left adrenal and lymph nodes and one to left kidney. Of the two cases of multiple hemorrhagic malignant hepatomas one showed metastasis to the regional lymph nodes.

Wilbur, et al., note that the low metastatic index of primary liver carcinoma for extrahepatic organs is in striking contrast to the multiple spread of carcinoma throughout the liver.

In a study of the histology of primary carcinoma of the liver one is impressed with the extensive venous thrombosis in the liver in spite of which embolic metastases to distant organs is rarely observed.

Cirrhosis. Cirrhosis of the liver has been mentioned as a possible contributory factor in the etiology of carcinoma of the liver. At least it seems to be a coexistent condition in a considerable proportion of cases.

Webb reported cirrhosis, slight to marked in 100 per cent of the twelve cases of primary hepatic tumors which he studied, and concluded that cirrhosis is an important factor in genesis of the neoplasm.

Greene states that Yamagiwa found seventy-five or 100 per cent of all hepatomas and approximately 50 per cent of all cholangiomas associated with cirrhosis. Jaffe found associated cirrhosis in 90 per cent; while according to Mallory, primary carcinoma of the liver almost never occurs without preceding cirrhosis. Greene points out, however, that it is not to be concluded that cirrhosis is the direct cause, noting that Jaffe in the course of 2,091 consecutive autopsies found sixty-eight cases of cirrhosis and only seven cases of primary hepatic carcinoma associated with cirrhosis.

McIndoe and Counseller report five cases of primary hepatic carcinoma, all associated with cirrhosis of the portal type. These authors stress the relation between hyperplastic liver tissue and malignant cells. They conclude that there can be little doubt that some specific factor or specific change in environment is responsible for transition from hyperplastic to malignant cells, a barrier confining their biologic function of growth and regeneration within normal limits. They are of the opinion that three or 4 per cent of the cases of cirrhosis will develop into carcinoma as the direct result of the changes induced by chronic inflammatory conditions. These authors describe a case of long-standing atrophy in which early carcinomatous changes of the hepatoma or liver–cord-cell type had taken place. Death was the result of the cirrhosis.

Wilbur and his associates[6] at Stanford University School of Medicine reporting a group of forty cases state that their series indicates "that the most important coexisting or perhaps contributing factor in the development of primary carcinoma of the liver is antecedent damage to the liver. In most instances this change is characterized by the presence of cirrhosis in all degrees from mild, so-called limited cirrhosis to far advanced atrophic cirrhosis of Laennec. In some instances damage to the liver was on the basis of toxic necrosis with subsequent healing."

Wilbur, et al., found cirrhosis in twenty-seven of fifty cases (54 per cent). They believe that while an incidence of 54 per cent is pertinent, it is sufficiently low to indicate that cirrhosis and primary carcinoma of the liver may occur independently and that they may occur coincidentally, without any direct causal relationship. They found the incidence of cirrhosis in their total necropsy series (11,045) to be 4.22 per cent or 3.13 per cent limited to advanced forms. In this series 14.2 per cent of the advanced cirrhosis patients developed carcinoma of the liver. They add that

"because of the implication that cirrhosis is a predisposing factor in pathogenesis of cancer of the liver, it may be preferable to calculate the ratio between cirrhosis and cancer on the total cases of cirrhosis, rather than those which are solely in the advanced group. When calculated for the total cases of cirrhosis the incidence drops to 10.5 per cent."

Wilbur also notes that the antecedence of nodular hypertrophy is not a uniform occurrence in those patients with cirrhosis who developed carcinoma; that even though such hypertrophy is present in some patients it apparently does not constitute an essential part of the preliminary picture.

In our study of 5,400 autopsy records cirrhosis was encountered in 214, an incidence of 3.96 per cent. Of the 214 cases of cirrhosis twenty-five showed hepatic carcinoma, 11.6 per cent. Of thirty-four cases of primary hepatic carcinoma in the total autopsy series twenty-five (73.5 per cent) had cirrhosis.

Twenty-five of the thirty-four primary liver tumors were malignant hepatomas and twenty-three of these livers showed cirrhosis (92 per cent). There were seven duct-cell carcinomas and two of these (28 per cent) showed coexistent cirrhosis. The two cases of multiple, hemorrhagic, malignant hepatomas did not show cirrhosis.

Incidentally, hemochromatosis was encountered eight times in the total autopsy series. In none of these was carcinoma present. In a series of forty-nine cases of primary hepatic carcinoma Wilbur, et al., found hemochromatosis in three coexistent with cirrhosis.

Prevalence. In our study of 5,400 consecutive routine autopsies 2,854 cancerous growths (51 per cent) were encountered. There were thirty-four primary hepatic carcinomas an incidence of .629 per cent of the 5,400 autopsies.

Charache[1] furnished an extensive study of the prevalence of primary liver carcinoma based on the autopsy records of thirty-one institutions of various countries. The total number of autopsies collected was 159,762 (representing all deaths that came to autopsy). Of these, 808 proved to be primary carcinoma of the liver giving a percentage of .506.

Greene[2] reviewed the literature of the last ten years and found 386 post-mortem or biopsied cases. He quotes the reported incidence of various authors: D'Aunoy, et al., twenty-three cases of primary hepatic carcinoma in 6,050 autopsies (.38 per cent); Abel and Levy, 16 cases in 4,400 autopsies (.363 per cent) and Gustafson, sixty-two cases in 24,400 autopsies (.257 per cent). Other percentages of occurrence noted by Greene were Lynch, .516 per cent, Bernes and Russum, .363 per cent and Smith, .60 per cent.

Neuman[4] reported that primary hepatoma (no cholangiomas) occurred eight times in 8,200 autopsies at St. Elizabeth's Hospital, Washington, D.C.

Webb[5] states that in 1,817 autopsies (all American negroes) at Freedman's Hospital, Washington, D.C., twelve cases of primary carcinoma of the liver and 166 carcinomas of all types were diagnosed. This was an incidence of .66 per cent for primary hepatic carcinoma and 7.2 per cent for cancer of all types.

In regard to the series which forms the basis of our report (thirty-four primary hepatic carcinomas a .629 per cent occurrence in 5,400 autopsies) it should be noted that it originates from a hospital which is primarily a tumor center (51 per cent of the autopsies show neoplasms). It should also be noted that the patients are veterans of World Wars I and II.

Age. Primary carcinoma of the liver is described in the literature at all ages from earliest infancy to old age but it is most common after forty. In our series of thirty-four tumors under discussion the following age distribution was noted: malignant hepatomas, one in twenty to thirty year group; three in the thirty to forty year group; five in the forty to fifty year group and sixteen over fifty; cholangiomas, four in the fifth decade and three over sixty years old; multiple hemorrhagic malignant

hepatoma, the two cases of this tumor occurred in the forty to fifty year age group.

SUMMARY AND CONCLUSIONS

1. In a review of 5,400 consecutive routine autopsies thirty-four cases of primary carcinoma of the liver were encountered (.629 per cent).

2. Three histologic types of primary liver carcinoma are described, namely, malignant hepatoma or liver-cord-cell tumor (this occurred twenty-five times, 73.5 per cent); duct-cell carcinoma or cholangioma (this occurred seven times, 20 per cent) and multiple hemorrhagic malignant hepatoma (this occurred twice, 5.9 per cent).

3. In the total autopsy series 214 cases of cirrhosis were noted (3.96 per cent).

4. Twenty-five of the 214 cases of cirrhosis had primary hepatic carcinoma (11.6 per cent) occurrence.

5. Twenty-five of the thirty-four cases of primary hepatic carcinoma showed cirrhosis (73.5 per cent) incidence.

6. In the total autopsy series hemochromatosis was encountered eight times. None of these were associated with primary carcinoma of the liver.

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SARCOMAS OF THE STOMACH

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THE purpose of this paper is to correlate some of the important clinical and pathologic features of sarcoma of the stomach as evidenced from a study of nine patients. This includes three patients with lymphosarcoma, one with reticulum cell sarcoma, two with leiomyosarcoma, two with fibrosarcoma and one with fibroliposarcoma. We will discuss a few of the more salient facts which should be borne in mind when one is called to treat this condition. Between 1920 and 1947 nine patients with sarcoma of the stomach were admitted to the Brooklyn Jewish Hospital. The diagnosis in all of these was confirmed by microscopic examination. During the same period 1,063 patients with carcinoma of the stomach were observed at the hospital. By comparing these figures it is apparent that the relative frequency of sarcoma to carcinoma of the stomach is 1:118 or approximately 0.84 per cent. It has been generally estimated that sarcoma comprises 1 to 8 per cent of all neoplasms of the stomach and according to Fenwick[1] 5 to 8 per cent of all gastric neoplasms are sarcomas.

It has been the consensus that both sexes are equally affected although some report a preponderance of the lesion in the male. In this series six patients were males and three females, a ratio of 2:1 in favor of the male.

The tumor affects all age groups. It is most commonly seen, however, in patients between the ages of forty and sixty years. The average age incidence is reported to be about a decade less than that estimated for carcinoma. In our series the ages varied between twenty-eight and seventy-one years, the average age being approximately fifty-five years. This figure is somewhat higher than that reported by other observers. There appears to be no definite relationship between the histologic character of the tumor and the age of the patient although it has been noted that of the various malignant connective tissue growths of the stomach lymphosarcoma affects the younger age groups. In this series the ages of the patients with lymphosarcoma ranged from thirty to seventy years, averaging fifty-five years.

A diagnosis of sarcoma of the stomach is seldom made clinically due to the fact that the signs and symptoms produced by this type of malignant growth are little different from those caused by other gastric neoplasms. Although there is nothing specific in the clinical manifestations of these patients which might lead to a diagnosis of sarcoma, the appearance of a mass soon after the onset of symptoms is suggestive of this type of tumor. The clinical manifestations of sarcoma are often indistinguishable from carcinoma and sometimes from benign tumors of the stomach. The diagnosis is often confused with carcinoma, peptic ulcer or benign bleeding gastric myoma. The onset of the disease is often insidious; it may be acute, especially in the presence of secondary complications resulting from the tumor growth such as gastric hemorrhage, perforation or obstruction.

The clinical picture presented by this group of patients with sarcoma of the stomach merits some detailed description although in many respects the tumors followed the pattern previously described by many authors. The early symptoms and

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signs are not distinctive by themselves and are similar to those associated with other gastric lesions. The laboratory tests although of great value are by no means infallible. Practically all the patients operated upon presented past histories which may have had bearing on their illness. Analysis of the diagnostic facts relating to this disease shows that pain is the most constant subjective symptom. It was present in all of the patients and varied in duration from several weeks to several months before medical aid was sought. Anorexia, nausea and vomiting were frequent complaints and occurred in six of the patients. Only two patients complained of moderate loss of weight.

The outstanding physical findings consisted essentially of the following, namely, a palpable abdominal mass usually located in the epigastrium or left upper abdomen either freely or partly movable was found in five of the nine patients. The general nutrition was fairly well preserved and some of the patients were obese. Pallor associated with weakness was a characteristic finding in five patients, melena occurred in four patients, in one it was absent and in the remaining three it was not reported. Most of the patients displayed a marked degree of secondary anemia with an average concentration of hemoglobin of 50 per cent. The highest concentration of hemoglobin in the series was 82 per cent in a patient with lymphosarcoma; the lowest was 25 per cent in one patient with leiomyosarcoma and in another with fibroliposarcoma. Patients with low hemoglobin often complained of considerable weakness, dizziness and syncope. Gastric extraction was done in only a few of the patients and showed a normal or slightly subnormal acidity. In this respect the laboratory findings vary markedly from those found in carcinoma of the stomach when gastric acidity is very low or entirely absent.

Roentgenologic examination of the stomach may not determine the exact character of the neoplasm but a diagnosis of gastric tumor almost always could be made. While in some instances certain radiologic features are present with sufficient regularity to be suggestive of the lesion in the stomach, yet because of the lack of any typical changes characteristic of the disease, the diagnosis is not always clear. In this series six of the patients presented definite radiologic evidence of a tumor in the stomach and in one patient a positive diagnosis of sarcoma was made by the roentgenologist. In two patients the roentgen findings were reported as negative.

A correct clinical diagnosis of sarcoma of the stomach was made in two patients. In one patient it was diagnosed as gastric carcinoma, in two, gastric ulcer, in one, malignant polyp and in another, retroperitoneal sarcoma. One patient had in addition to sarcoma of the stomach a carcinoma of the pancreas which confused the clinical picture. In another patient the lesion was an incidental finding at autopsy in a patient who died of pneumonia following an operation for strangulated hernia.

Gastroscopy may prove helpful at times in the diagnosis of sarcoma of the stomach. A sarcomatous lesion may present a characteristic picture which is entirely different from all other diseases of the stomach. It has been stated that in a patient presenting gastric symptoms of several months' duration with a readily palpable, freely movable tumor of the stomach but without loss of weight, general debility and cachexia common to carcinoma of the same duration, one should suspect a sarcomatous growth. In our series gastroscopic examination whenever done was of no particular aid in reaching a correct diagnosis.

Very little is known about the etiology or pathogenesis of sarcoma of the stomach and it is generally agreed that no single specific factor is responsible for its development. Trauma seems to play a very minor role in the etiology of this tumor. So far as our records show it did not play a role in any of the cases. Farr[2] explains the relative infrequency of sarcoma as compared with carcinoma on the premise that the con-

nective tissue elements of the stomach are less exposed to injury than the lining epithelium of the mucosa. D'Aunoy and Zoeller[3] believe that it is theoretically possible for sarcoma to develop from a peptic ulcer because the latter stimulates considerable and prolonged formation of fibrous connective tissue. Peculiarly enough, sarcoma is far less frequently associated with gastric ulcer than carcinoma.

Of the various forms of sarcoma of the stomach lymphosarcoma is the most commonly encountered. According to Fenwick lymphosarcoma comprises about 62 per cent of sarcoma of the stomach, fibrosarcoma 22 per cent and leiomyosarcoma and angiosarcoma the remainder. Of a series of fifty-four cases of gastric sarcoma reported by Balfour and McCann[4] 71.3 per cent were lymphosarcoma, 13.3 per cent were fibrosarcoma and 6.7 per cent were myosarcoma. Our series show that approximately 44 per cent were lymphosarcoma, 22 per cent myosarcoma, 22 per cent fibrosarcoma and 11 per cent fibroliposarcoma. Our series is too small for statistical analysis but it denotes, nevertheless, a preponderance of lymphosarcoma as compared with the other sarcomatous tumors of the stomach.

The location of the tumor in the stomach may vary considerably. The most common sites are in the curvatures, very rarely in the orifices or in the pylorus as is the case with carcinoma. According to Balfour and McCann the most common site of origin is the lesser curvature, frequently the antrum, while the cardia is never involved. In our series the most common site of origin was the lesser curvature. In one case the tumor was located in the prepyloric region, in another, the fundus and in a third, the cardia.

The gross appearance of these tumors shows great variations and depends largely on the character of the cell composing the tumor, rapidity of growth and their location. These tumors are notable for their variation in growth rate which occasionally is very rapid and at other times exceedingly slow. Some tumors, especially the lymphosarcomas, pursue a much more rapid course. Between these extremes there are all grades of variations but with the greater number exhibiting slower growth and with a relatively small number spreading by metastasis. The tumors show a frequent tendency to grow expansively in the connective tissue and vascular framework of the organ rather than to grow by infiltration as is the case with carcinoma. The tumor may appear well circumscribed although not encapsulated. Very vascular tumors and, therefore, well nourished tumors may grow to a very large size. Cantwell[5] reported a case of sarcoma of the stomach which weighed 12 pounds. Usually the rapidly growing tumors are associated with degeneration, necrosis and hemorrhage which may take place within the tumor itself or in the stomach cavity. Perforation is reported to be a fairly common occurrence. Pressure necrosis on the mucosa from a rapidly growing underlying tumor may often lead to ulceration and hemorrhage. The direction of growth of the tumor may be inward, outward or intramural. The endogenous variety is usually bulky and may form polypoid masses which may become ulcerated, bleed or perforate. The growth of these tumors inwardly may sometimes obstruct the cavity as it occurred in one of our patients. The intramural forms grow more slowly and tend to be delineated from the surrounding structures of the stomach wall while the exogenous variety grow outwardly toward the serosa and form a bulge on the exterior of the wall.

The various forms of sarcoma of the stomach noted in this series were one reticulum cell sarcoma, three lymphosarcomas, two leiomyosarcomas, two fibrosarcomas and one fibroliposarcoma.

There was one case of reticulum cell sarcoma which arose from the lesser curvature of the stomach and grew endogenously into the cavity. The tumor was very bulky, grey-white in color, partly firm and partly soft and friable. Microscopically, the tumor was made up of large pale cells with a vesicular, dark-staining nucleus; very few

mitoses were encountered. The cells were loosely arranged and the stroma consisted of fine fibrillar connective tissue. (Fig. 1.)

In general, the lymphosarcoma arises in the submucous layers of the stomach and infiltrates the surrounding tissues. Very often all layers of the stomach are involved except the serosa. Involvement of the regional lymph nodes occurs frequently and was found in all the three patients of this series. In one instance the tumor metastasized in addition to the regional lymph nodes to the pancreas, spleen, kidney and adrenal. In one patient the tumor was located in the prepyloric region, in another in the lesser curvature and in a third in the anterior aspect of the fundus.

At operation the gross appearance of the tumor differs sufficiently from that of carcinoma to be identified or suspected.

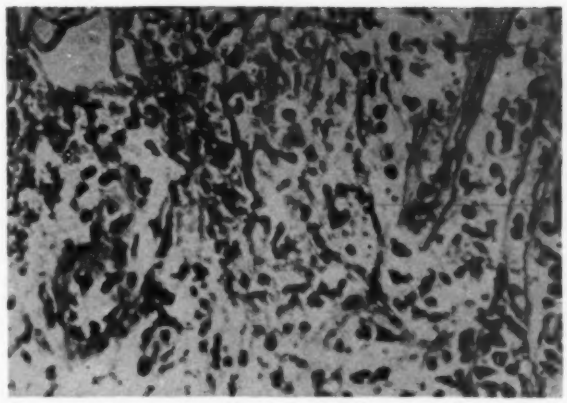

FIG. 1. Photomicrograph of reticulum cell sarcoma. (Hematoxylin and eosin × 120.)

The lymphosarcomatous mass is usually firm, often necrotic and friable, nodular and rubbery. The mucosa is involved early with tendency to ulcerate, hemorrhage or perforate. Secondary infection may set in and result in chills and fever.

Microscopically, the tumor consists of sheets of cells which show no definite structural pattern. The cells are usually of uniform size and shape, with very little cytoplasmic substance. The nucleus is large, spherical, hyperchromatic and occupies almost the entire substance of the cell. Mitotic figures are frequently encountered denoting a fairly high degree of malignancy. (Fig. 2.)

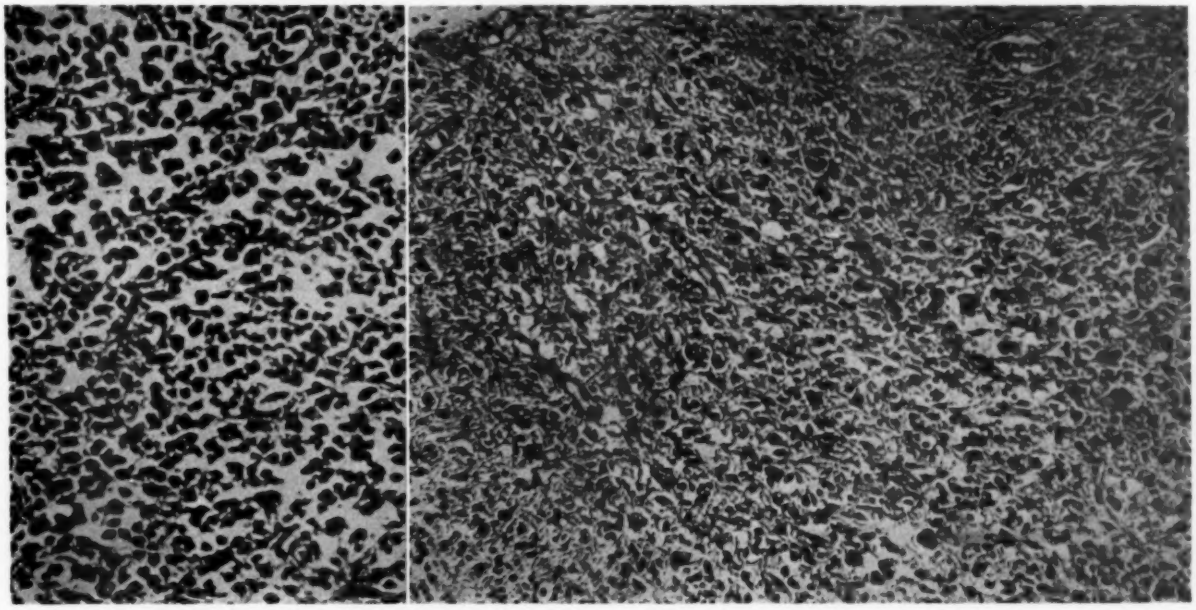

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FIG. 2. Photomicrograph of lymphosarcoma. (Hematoxylin and eosin × 120.)
FIG. 3. Photomicrograph of leiomosarcoma; note giant cells. (Hematoxylin and eosin × 120.)

The leiomyosarcoma is not a very malignant form of tumor. It arises from the muscular coat of the stomach and usually grows expansively into the wall where it remains localized. In the cases presented here the tumor appeared as a nodular, lobulated and polypoid growth and extended into the cavity of the stomach. The overlying mucosa was partly intact and partly ulcerated forming a deep

crater in the center of the tumor. There were areas of extensive necrosis and hemorrhage in different portions of the tumor.

Microscopically, the tumors reproduced in great details the normal components and structure of the musculature of the stomach from which they arose, although in a distorted and exaggerated fashion. This distortion of the normal picture was accentuated by the pleomorphism of the cells as well as by the degeneration of the tumor tissue. The cells were fusiform and arranged in interlacing bundles, thus closely resembling the usual smooth muscle fibers. The nuclei varied from oval and elongated to rod-shaped. In areas the cells were swollen and hydropic; many of the cells were large and multinucleated. Mitotic figures were very few in number. The stroma consisted of moderately well vascularized connective tissue which varied in amount and character. Sometimes it was rather meager, fibrillar and coarse while elsewhere it was abundant, dense and acellular. Areas of necrosis and hemorrhage were found irregularly scattered through the tumor. (Fig. 3.)

Fibrosarcoma of the stomach arises from the wall, most frequently in the submucosa, and usually tends to remain localized to its site of origin and not expand endogenously or exogenously. At times, however, the tumor may grow inwardly or outwardly and forms a sessile or pedunculated growth on the interior of the stomach or a bulge on the exterior. In both our patients with fibrosarcoma the tumor was nodular and pedunculated and grew endogastrically; in one patient it caused considerable narrowing of the cavity of the stomach. The tumor showed partial ulceration of the surface mucosa with widespread necrosis.

Microscopically, these neoplasms display the cellular components and structural patterns characteristic of fibrous connective tissue. The cells are frequently elongated and arranged in closely packed interlacing strands. In this series the tumors were made up of sheets of elongated or spindle-shaped cells running in various directions and arising apparently in the submucosa. Occasionally, the cells appeared spherical or polygonal in shape. The nuclei were elongated, hyperchromatic and showed very few mitoses. In the stroma were numerous delicate, thin-walled capillaries, some of which were invaded with tumor tissue. (Fig. 4.)

There was one case of fibroliposarcoma in this series. A good deal of information exists about benign fatty tumors but not nearly as much is known about the malignant ones because of their rarity. The gross characteristics of this tumor are not much different from the other forms of sarcoma of the stomach described previously. In our patient the tumor appeared as a very large lobulated, partly polypoid mass growing inwardly into the cavity of the stomach. There were widespread areas of necrosis and hemorrhage.

Microscopically, the tumor consisted of two different cell elements, one a fibroblast and the other a lipoblast. The fact that both these types of cell developments may be found in the same tumor seems to be an observation of some importance. It seems that the same ancestral cell in the primitive mesenchyme is capable of forming either or both these forms of cells. If this is true, it should lead us to look upon this type of mixed fibroblastic and lipoblastic tumor not as a separate and distinct tumor type but as a single tumor capable of manifesting different degrees of differentiation. Although in a single tumor neoplastic cells of both types are found growing independently of each other, in large portions they display quite a characteristic relationship. The tumor under observation consisted for the most part of fibroblasts arranged in whorls similar in character to that seen in the case of fibrosarcoma. Very few mitoses were observed. The lipoblastic component of the tumor was made up of vacuolated fatty cells sometimes not much different in appearance from that of ordinary fat cells. The lipoblasts were widely distributed amidst the fibroblastic elements of the tumor. Widespread areas of necrosis

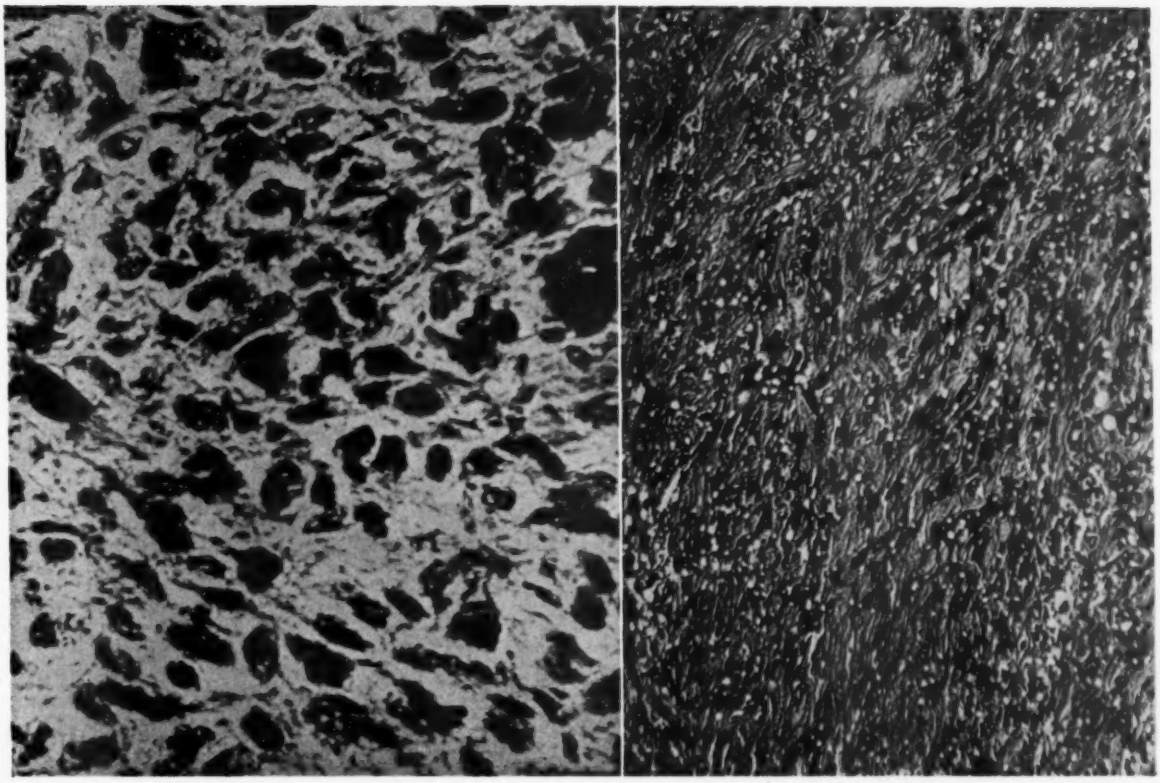

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FIG. 4. Photomicrograph of fibrosarcoma. (Hematoxylin and eosin × 120.)
FIG. 5. Photomicrograph of fibroliposarcoma; note vacuolated cells. (Hematoxylin and eosin × 120.)

were also present with chronic inflammatory cell infiltration and evidence of old and recent hemorrhage. (Fig. 5.)

It is generally agreed that the best form of treatment of sarcoma of the stomach is primarily surgical but it should be pointed out that some sarcomas have proved to be definitely radiosensitive and for this reason radiotherapy as a method of treatment must not be neglected. This is particularly true of lymphosarcoma which is extremely sensitive to radiotherapy.

The prognosis must be guarded and depends to a large extent on the particular histologic structure of the neoplasm. It is believed that the leio- and fibrosarcoma are more slowly growing tumors and, therefore, offer a better prognosis than the lymphosarcoma which is more malignant and metastasizes early and rapidly. Furthermore, the pedunculated and polypoid forms of sarcoma are more readily removable and offer a better prognosis than the diffuse, infiltrating malignancies which are more difficult to remove.

SUMMARY

Nine cases of patients with sarcoma of the stomach are reviewed. In three of these the tumor was a lymphosarcoma; in two, leiomyosarcoma; in two, fibrosarcoma; in one, fibroliposarcoma and in one, reticulum cell sarcoma.

The diagnosis of sarcoma of the stomach is rarely made before a microscopic examination of the tumor since the lesion simulates very closely other gastric neoplasms.

The clinical and pathologic aspects of these tumors are generally discussed.

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ACUTE PANCREATITIS*

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ALTHOUGH considerable progress has been made in the early recognition of acute pancreatitis, it still remains one of the most difficult acute surgical conditions to diagnose and one that is frequently disregarded when considering acute upper abdominal disorders.

With this in view twenty-five patients admitted to the Open Division of the Kings County Hospital from 1943 through 1947 have been studied in order to evaluate the clinical picture and results of treatment. It is to be recognized that the treatment of this condition is not standardized although the tendency toward conservatism is gaining in popularity.

The causative factors of acute pancreatitis remain unknown. McWhorter classified acute pancreatitis from an etiologic factor as follows:

(1) infectious; (2) non-infectious (mechanical or obstructive, or chemical); (3) degenerative (benign or malignant, or vascular degeneration or hemorrhage); (4) trauma and (5) a combination of factors.

Judging from the aforementioned one can readily observe that no single factor can be held responsible. Recently some writers have called attention to anaphylactic shock of the neurovegetative system as a cause, the shock being produced by foreign proteins or substances which are toxic to the tissues, like histamine.

Clinically and pathologically, it is wise to consider two types, namely, the simple, acute edematous and the acute, pancreatitic necrosis or hemorrhagic form. In this series the latter group was less common but much more severe in the clinical picture and course. In the former the pancreas was found to be enlarged, swollen and hard. In the hemorrhagic or necrotic form the pancreas was enlarged, soft, friable and hemorrhagic. Areas of fat necrosis were found in the mesentery, omentum and general peritoneal cavity, with a varying amount of blood-tinged fluid in the peritoneal cavity. At times there was retroperitoneal extravasation of blood-tinged pancreatic fluid. In two cases in this group a sloughing, gangrenous pancreas was presented, with only a small amount of residual pancreatic tissue present.

In this series the patients varied in age from fifteen to seventy-one years, the majority (66 per cent) being between thirty-five and sixty years of age.

The disease appeared about equally divided between males and females. There was a positive history of alcoholism in 33 per cent and 50 per cent gave a past history of gallbladder or gastrointestinal symptoms. Two patients had been operated upon previously for acute pancreatitis.

The symptomatology was indeed variable, undoubtedly depending upon the nature of the morbid process. Of those that gave an alcoholic history, the onset varied from immediately following to nine hours after the intake of alcohol. The most constant symptom was pain, sudden in onset, severe, usually in the upper abdomen; in 66 per cent of the cases it was localized in the epigastrium. In 25 per cent pain was present in the right upper quadrant or upper abdomen, in two cases it was localized to the right lower quadrant and in one the clinical picture was typical of acute appendicitis. In 25 per cent the pain radiated to the left shoulder or left scapular region.

Vomiting was the next most frequent symptom, being present in over 85 per cent of the cases. It was persistent and recurrent. Only one patient presented he-

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matemesis. One patient presented the symptom of diarrhea. Nausea was as frequently present as vomiting.

Physical examination again depended on the nature and extent of the morbid process. Only two patients were admitted in evident shock. The most important thing that can be stressed is that these patients are not in shock or collapse as the textbooks have described. Dehydration was present in most cases. This was due to persistent and recurrent vomiting. The abdominal findings varied from moderate tenderness and rigidity in the upper abdomen to a diffusing widespread involvement of the entire abdomen of marked rigidity and tenderness. The signs were so varied that perforated ulcer, intestinal obstruction, acute biliary disease, mesenteric thrombosis, alcholism, kidney colic, acute appendicitis and acute gastroenteritis were among the admitting diagnoses made in this large city hospital.

Most of the patients in this series (i.e., 33 per cent) were operated upon for perforated ulcer. The bluish discoloration of the skin in the lumbar and periumbilical regions was not noted in any of our cases. Fallis pointed out that this sign is present in only 10 per cent of the cases. It can be easily overlooked because it is not frequently considered.

In most of the cases the temperature ranged from 98.6° to 101°F. Only four patients were admitted with a temperature of 102°F. or over. It did not appear to indicate the extent of the inflammatory process although its presence signified that the process was probably active; it was of no prognostic significance. In most cases the patients were admitted with normal or only slightly elevated pulse rates.

Laboratory Studies. The white blood cell counts varied from 10,000 to as high as 36,000 in one case. There was a marked predominance of polymorphonuclear cells. Hemoconcentration was present in most cases presenting persistent and recurrent vomiting. Urinalysis revealed the presence of albuminuria in a large majority of cases.

Most clinical reports demonstrate an increase in the amylase activity during the early stages of this disease; this was present in over 90 per cent of the cases in our series when the test was made. In one of the cases, that of a child fifteen years of age, the blood specimen contained many fat globules, with the laboratory making the diagnosis of acute pancreatitis.

Blood sugar determinations did not reveal any hyperglycemia. In fact the majority was normal or below normal.

Other chemical studies were carried out as indicated but were not of any clinical significance as far as the diagnosis of pancreatitis was concerned. However, they did indicate the degree of dehydration and the necessity of fluid replacement.

Roentgenologic Findings. Unfortunately, roentgen ray studies can give no help in the diagnosis of acute pancreatitis. It is practically routine at the Kings County Hospital to have scout plates taken in questionable acute abdominal surgical emergencies. Positive findings such as free air under the diaphragm, as seen in perforated ulcer or distention and puddling in intestinal obstruction, excluded the diagnosis of acute pancreatitis.

During the past decade there has been a complete reversal in the management of this condition. The conservative treatment has rendered acute pancreatitis a medical problem. It is no longer considered an operative emergency. However, despite the fact that the clinical diagnosis can be determined in the great majority of cases by the history, physical examination and serum amylase test, there are many instances in which the diagnosis remains obscure, rendering emergency surgery necessary in order not to neglect a perforated ulcer or any other acute surgical condition. In the present series fifteen patients were subjected to surgery. Twelve patients were explored within forty-eight hours; of these, ten were explored within twenty-four hours and two between twenty-four and forty-eight hours. There were four deaths, a mortality of

33⅓ per cent. Five patients operated upon within twenty-four hours had quite a stormy course but recovered. Of the three patients explored after seventy-two hours, all recovered. The remainder of the patients were not operated upon, the diagnosis of pancreatitis being based mainly on the serum amylase determination. In the non-operative group one patient succumbed. This was a female who was admitted with a two-week history of symptoms and who was not in any condition for surgery. She presented a large subphrenic collection on the right side, with a marked pleural effusion. Therefore, of the nine patients admitted early, when the diagnosis was established by the serum amylase test, none was operated upon and all recovered.

These findings seem to confirm the universal opinion that conservative treatment is the treatment of choice, provided suppuration has not occurred.

In the operated group the procedures varied from simple exploration and drainage of the lesser sac to cholecystotomy and choledochotomy.

Postmortem examinations were done on three patients. All presented the features of suppuration; two the presence of a subdiaphragmatic collection with extension and one severe fat necrosis with hemorrhage and suppuration throughout the entire pancreas.

The conservative treatment consisted of the elimination of food by mouth, intravenous administration of saline and glucose, blood, plasma, aminogen, chemotherapy and oxygen.

SUMMARY

1. A review of twenty-five cases of acute pancreatitis seen in the Open Division of the Kings County Hospital is presented.

2. The clinical features are presented and discussed.

3. The results of non-operative and operative treatment are compared.

4. Conservative therapy is recommended as the procedure of choice if the diagnosis is made.

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AN IMPROVED TECHNIC FOR ARTHRODESIS OF THE LUMBOSACRAL SPINE*

LEWIS M. OVERTON, M.D.
Albuquerque, New Mexico

SURGICAL procedures for fusion of the painful spine followed the technic of Albee or Hibbs with some modifications until after Mixter and Barr reported their study on rupture of the intervertebral disc. This study created much new interest in the treatment of lesions of the lower back and brought to our attention the fact that the results from surgical procedures to secure arthrodesis of the spine had not been satisfactory. It was generally believed that many of the failures were due to a pseudo-arthrosis rather than to an error in diagnosis.

Gradually a number of new procedures were evolved in an attempt to improve the end results. Bosworth and Breck and Basom modified the clothespin graft that had been developed by Gibson. In this modification the graft was wedged between the base of the adjacent spinous processes fitting snugly on the denuded lamina with the vertebrae somewhat distracted. McBride dovetailed a bone block into a rectangular slot excavated across the articular facets with the vertebrae distracted. Moore combined both of these procedures. King placed metallic screws across the apophyseal joints after having excised the articular cartilage. He then placed fine grafts across the lamina. Anderson and his associates excised a major portion of the inferior facet, removed the articular cartilage from the exposed superior facet and filled the defect with finely pulverized bone.

All of the procedures resulted in some improvement in the end results; however, there still persisted too high a percentage of pseudoarthrosis. Cleveland, Bosworth, et al. in a series of 594 cases reported 3.4 per cent of pseudo-arthrosis when only the fifth lumbar was fused to the sacrum, but 17.4 per cent such failures when the fourth lumbar was included, and 33.39 per cent when the third lumbar was included. There was pseudo-arthrosis in 10 per cent of King's forty-four cases. Barr reported approximately 90 per cent good results in 150 cases but did not give the percentage in which pseudo-arthrosis was present.

The relative frequent occurrence of pseudo-arthrosis has been a stimulus for further study in improving the operative technic in an attempt to secure arthrodesis in all cases. It is believed that the basic criteria for any arthrodesing operation on the lower back is that it does not even temporarily increase the instability of the back. Furthermore, this procedure must produce arthrodesis of the apophyseal joints since they are the site of damage in most instances; therefore, their obliteration is necessary if the pain is to be relieved in all cases. It is desirable and possibly essential that this be accomplished with the lumbosacral angle corrected to normal position or in slight flexion. This lessens the strain on the whole lower back as well as increasing the space in the intervertebral foramen which is an insurance against impingement of the nerve roots.

The procedure herein described utilizes the wedge graft but has modified the arthrodesis of the apophyseal joints. All procedures in which the articular cartilage is excised from these joints result in considerable instability even after the space has been packed with cancellous bone. The author's procedure has as its primary purpose the arthrodesis of the apophyseal joints without disturbing their stability. The wedge graft is used largely to maintain the corrected lumbosacral angle and to produce internal fixation so that the apo-

* From the Section of Orthopedic Surgery, Lovelace Clinic, Albuquerque, N. Mex.

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* From the Section of Orthopedic Surgery, Lovelace Clinic, Albuquerque, N. Mex.

physeal joints and lamina grafts will fuse promptly.

At operation the lower back is exposed through a midline incision. The muscles, ligaments and periosteum are removed from the spinous process, lamina and apophyseal joints. A modified Bennett retractor as described by King greatly facilitates exposure of the latter joints. The interspinous ligament, entire ligamentum flavum and the inferior portion of the capsule of the apophyseal articulations are removed. This allows distraction of the lamina without difficulty. The same procedure is carried out between each vertebra that is to be arthrodesed. Notches are cut on the base of the inferior surface of the superior spinous process and on the superior surface of the inferior one so as to allow locking of the wedge graft. In addition, the outer cortex of the sacrum is turned up in order to allow further locking of the lower end of the graft. (Fig. 1.) This is necessary when the spinous process of the first sacral segment is very small. If more than two vertebrae are to be arthrodesed, the intervening spinous process is removed. The spinous processes and laminas are then distracted sufficiently only to correct the lordosis to the normal angle, unless there is a narrowing of the intervertebral space. In such cases the distraction is continued until the normal space is restored to the intervertebral foramen. This is accomplished by flexing the patient at the lumbosacral junction and then supplementing the flexion with a spinous process separator. Bone chips are turned up from the lamina and placed across the interlaminar space. (Fig. 2.) Additional chips are obtained from the excised spinous process and donor site of the graft.

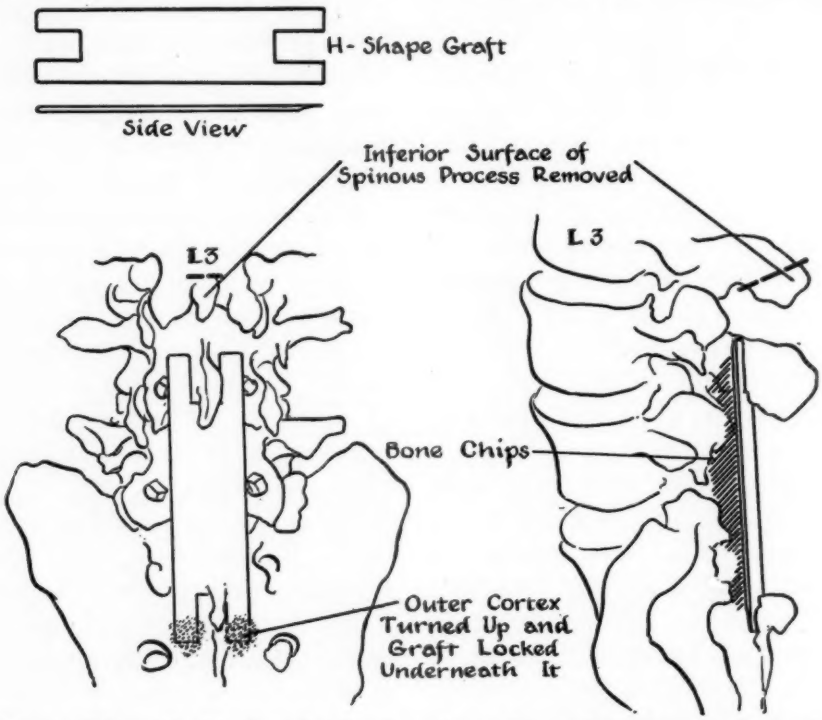


FIG. 1. Schematic drawing showing how the wedge graft is shaped and fitted into place.

A second incision is made over the posterosuperior spine adjacent to the crest of the ilium. This may be accomplished through a single incision in the male. The desired amount of bone is removed in one large piece. The graft may be taken from the tibia when several vertebrae are to be fused; however, iliac bone is much more desirable and it is used whenever possible. The wedge graft is shaped as shown in Figure 1. It is then placed in the prepared

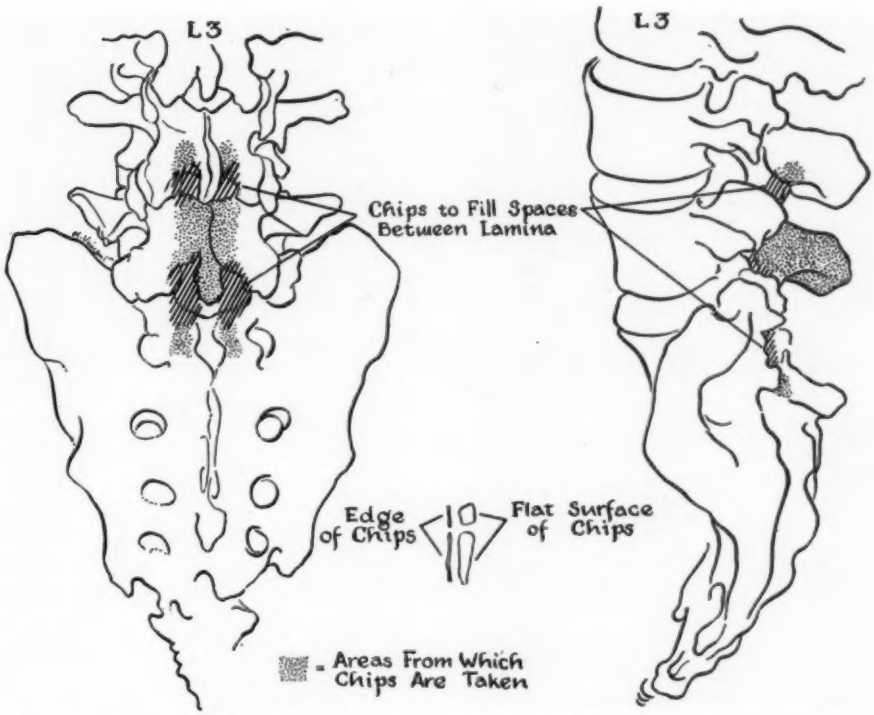


FIG. 2. Illustrates method of preparing graft bed and bone chips bridging the interlaminar space.

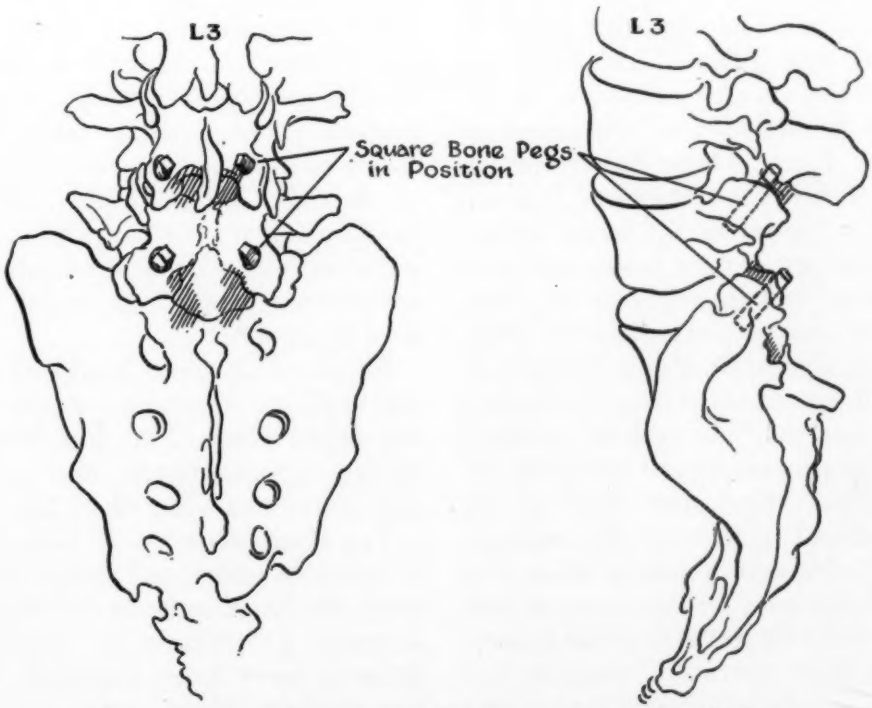
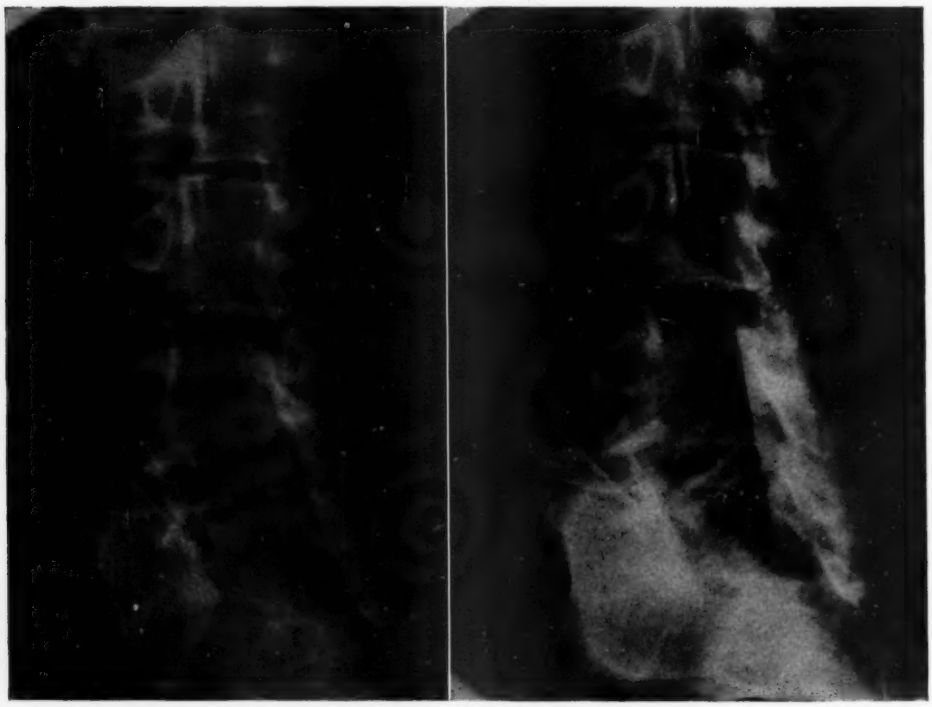


FIG. 3. Shows the bone pegs in place across the apophyseal joints.



4A 4B

FIG. 4. A and B, right and left oblique roentgenograms showing the bone grafts across the apophyseal joints one year after operation.

bed and the patient is straightened to the neutral position. Thereby the graft is locked firmly into place. Drill holes are made across the apophyseal joints of the vertebrae to be included in the fusion as described by King. These holes are enlarged to ¼ inch in the female and 9/32 inch in the male as the latter has larger joints. A square bone peg is then fashioned from the donor bone and driven into the hole, passing across the apophyseal joints. (Fig. 3.) These pegs should fit snugly but should not be too large or they may be broken while being inserted. The inferior one-half of the spinous process of the vertebra immediately above the upper limit of the fusion is removed to prevent its impingement against adjacent spinous process. The failure to do this is often the cause of persistent pain at the upper level of the arthrodesed area. The operative wounds are closed in the usual manner and the patient is put in a firm bed without any external support.

The patients are turned regularly but are not encouraged to turn themselves until the acute muscle pain subsides. This usually requires two to three days. They are allowed out of bed on the tenth to twelfth postoperative day and leave the hospital about four days later. A reinforced corset is used only to remind patients not to flex the spine acutely. The internal fixation relieves the pain so that movement is carried out without discomfort. Activity is encouraged although undue back strain is to be avoided.

Flexion and lateral bend roentgenograms are used to determine when arthrodesis has taken place. This has been found to average approximately four months. Normal activity is allowed at this time.

Too short a period of time has elapsed to make an end result study; however, the early results have been striking enough to warrant a preliminary report. Sixteen patients have been operated upon using this technic. Eight cases have been followed up for six months or longer. All of this group have returned to their former occupation. There were two automobile mechanics, two laborers, two office workers,

one rancher and one housewife. All of these individuals have stated they have been free of back pain. Performing their usual duties has not produced any discomfort.

The roentgenograms revealed solid, bony union in all cases as indicated by the lateral bend and flexion view films. We have not been able to verify arthrodesis in the apophyseal joints in all cases by the roentgenograms but we believe the flexion and lateral bend films indicated solid, bony union in these joints. (Fig. 4A and B.)

SUMMARY AND CONCLUSIONS

A modification of the existing technics for spinal fusion has been presented. This procedure allows arthrodesis of the apophyseal joints without disturbing their stability. The early results indicate that this procedure is somewhat superior to the existing procedures. However, it is too early to draw any definite conclusions. An end result study will be made at a later date.

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NEW METHOD OF LIPECTOMY FOR ABDOMINAL OBESITY

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I WOULD like to emphasize that my new method for surgical treatment of abdominal obesity must not be looked upon as one that comes to the aid of the woman who is unable through laziness or lack of determination to restrict her diet. Such persons are not my main concern. They are difficult patients who seek the surgeon's help only because of vanity. On the other hand, such patients are also difficult to satisfy and I would like to warn surgeons who embark upon corrections of abdominal obesity to be careful and consider in great detail each aspect of the condition before undertaking any surgical intervention. Up to date no technic exists which can give perfect cosmetic results. Because the main object of these patients is the aesthetic appearance, they are bound to remain dissatisfied with the ultimate outcome of the operation; and the surgeon is heading for trouble should he undertake the correction lightheartedly. I cannot emphasize too strongly the issue of the recent court proceedings in California when a middle-aged woman sued the plastic surgeon for disfiguring her after an operation of this nature—and what is more surprising still, the reward of $100,000 to the patient. I personally am of the opinion that such an unfortunate incident would never have arisen if the surgeon had carefully considered the difficulties of such an intervention and explained in exact terms what the patient should expect from an operation of this kind.

It is obvious, therefore, that my primary concern is with the correction of abdominal obesity due to a disease and, furthermore, when it not only disfigures the patient herself but also interferes with her normal physiologic functions. Before undertaking the operation, however, the surgeon must bear in mind three principal factors: (1) functional disability which cannot be corrected by any other means than surgery; (2) exclusion of endocrine disorders or, if present, preliminary treatment of the disease; (3) willing and honest collaboration by the patient herself. When these three factors are well considered and the patient is told that she cannot expect an aesthetically perfect result other than be enabled to become a normal person again, the surgeon is justified to undertake the operation.

Historically, correction of abdominal obesity is not a new technic. We have records dating from 1899 of such an operation being performed by Kelly who even then distinguished two separate types of obesity. Kuester in 1926 produced a more detailed classification of abdominal obesity. One is known as diffuse abdominal obesity which as a rule is a part of general adiposity. This usually comes to the attention of the physician as being due to endocrine disorders. Of interest to the surgeon is the type of obesity known as pendulous abdomen (venter propendens). This can be complicated with prolapse of the abdominal wall which appears either diffuse over the whole of the abdomen or is localized around the midline.

Not only female patients suffer from abdominal obesity. The condition can also be seen in men although it is more pronounced in women and it is they who usually seek relief.

Etiology and Clinical Aspect. The etiology of localized abdominal obesity is not well known. Often endocrine dysfunction is responsible but sometimes patients normal in every other way are afflicted with it. Neither heredity nor racial factors play any role while the tendency is toward middle-

aged or old people. The patient ordinarily is a middle-aged woman who complains of a fat, pendulous abdomen for several years. As a rule these patients have undergone repeated reducing treatments without success. Upon clinical inspection one can observe a large, hanging abdomen, heavy and disfiguring, occasionally painful, presenting great difficulty to the patient in performing her normal physiologic functions. Sometimes the patient is confined to bed because of her inability to walk. One patient treated by the author was bedridden for over five years and had to be helped even to move her arms while eating. Often painful and troublesome eczemas develop in the abdominal folds due to excessive perspiration and constant skin friction. Finally, in extreme cases sexual intercourse is impossible and patients develop an inferiority complex which can degenerate into mental instability.

Symptoms. The most common symptoms are heaviness, eczema, pain, restricted movements and tiredness. These patients are unable to attend to their daily occupations; they are deprived from indulging in sports and are unable to dress normally.

There are several degrees of abdominal obesity varying from small skin excesses in the lower part of the abdomen to enormous increase of fat tissue which hangs in a heavy fold reaching to the middle of the thighs or even the knees.

Treatment. When considering abdominal obesity one must always bear in mind that the treatment would be medical as well as surgical. Before undertaking surgical correction every patient must be subjected to a vigorous diet and any functional disorder such as disturbed endocrine equilibrium, increased basal metabolism or digestive disturbances must be cured first. Such precaution not only renders the operation easier but also prevents unforseen complications which can compromise the result of the correction and endanger the life of the patient.

As contraindications for surgical treatment of abdominal obesity, cardiovascular diseases, pulmonary afflictions, chronic nephritis or mental disorders can be considered. On the other hand, disposition to skin keloids should be borne in mind when evaluating the cosmetic results of the operation.

PREVIOUS SURGICAL TECHNICS

Here one cannot emphasize too strongly that lipectomy is a major operation and must be considered as such. Therefore every precaution taken for granted in other major interventions must apply here as well. It is obvious that an infection would not only compromise the aesthetic appearance but also lead to complications which might be fatal to the patient.

It will be unnecessary to enumerate all the existing methods for correction of abdominal obesity. The fact that at least nine different methods exist shows that none is perfect. One does not look for a new technic when the already existing ones can give good results. One can mention names of well known surgeons such as Kuester, Schenelmann, Eitner, Babcock or Thorek who have given their attention to the correction of abdominal obesity; the technics which they have devised are known under their names. To summarize all these methods one can divide them into three main groups. One group includes technics which, while attempting to remove superfluous fat of the abdomen, leave undisturbed the portion of the umbilicus. The second group embraces technics which remove both superfluous fat and the umbilicus. The third group includes technics which aim at preserving the umbilicus but transpose it to a new position corresponding to the anatomic structure of the abdomen. All these technics use either horizontal or vertical incisions in the shape of a crescent, elliptical design or clover-leaf figure. Some technics combine vertical with horizontal excisions resulting in T-shaped scars or bat-wing incisions.

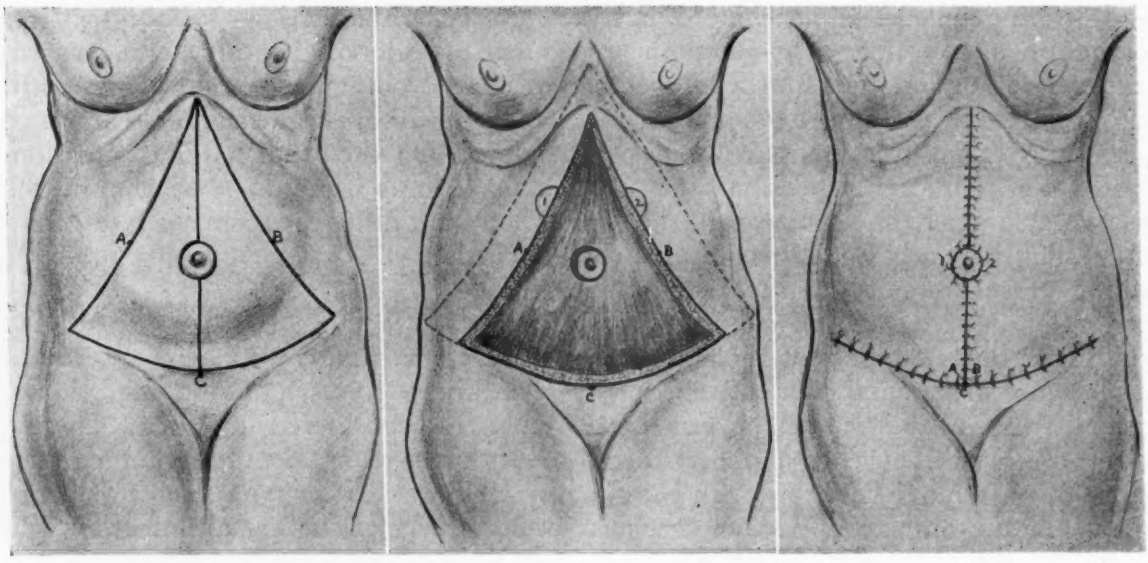


FIG. 1. Excision of umbilicus and position of the horizontal and oblique lines of incision. A, B and C are the points which will meet together in the middle of the horizontal incision.
FIG. 2. Excision of the abdominal skin and fat tissue; undermining of the wound edges of the oblique incisions; 1 and 2 are semi-circular excisions for the new position of umbilicus.
FIG. 3. Final result of operation after subcutaneous and skin sutures. A, B and C are brought together; 1 and 2 are the semi-circular excisions stitched round the umbilical skin.

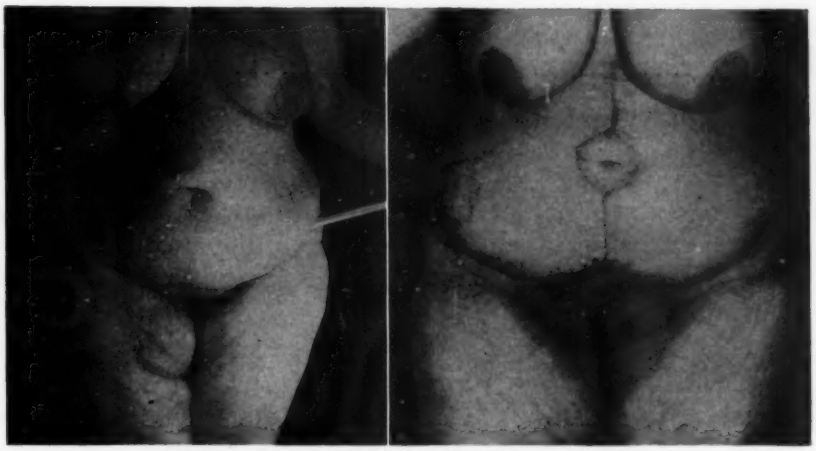
AUTHOR'S TECHNIC

For easier understanding of my method I have divided it into the following three stages:

Stage I. After thorough cleansing and preparation of the abdominal skin, excision of the umbilicus is performed. The incision must go through the skin down to the abdominal fascia leaving a cylinder of fat tissue which supports the umbilicus. Next a curved horizontal incision follows just above the hairline and extending from one iliac spine to the other. Lastly, two incisions unite the middle of the epigastrium close to the xiphoid process with the two ends of the horizontal incision. (Fig. 1.) All these incisions go through the skin and the whole of the fat tissue down to the abdominal fascia. The stage is completed by the removal of the portion of abdominal fat and skin enclosed between these incisions. Thorough hemostasis is, of course, essential.

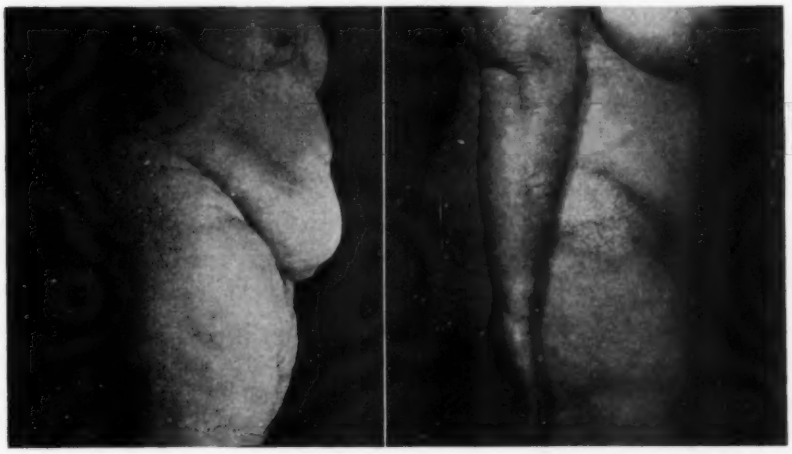
Stage II. The skin edges of the two oblique incisions are undermined extensively in order to allow them to be brought down and meet each other in the midline. Two semi-circular excisions of skin and subcutaneous tissue are made on both sides of the wound edges at a distance calculated in such a way as to coincide with the level of the umbilicus when the skin is pulled down. Usually the position of these semi-circular incisions is the distal ends of the upper third of the oblique incisions. This can vary, however, according to the amount of fat tissue involved. Next the undermined edges of the wound are drawn inward and downward toward the midline of the abdomen in such a way as to enable points A, B, and C to meet. (Fig. 2.) The orginal positions of the three points should be equally distant from the three corners of the abdominal excision.

Stage III. Subcutaneous sutures with interrupted catgut stitches are applied which distribute the skin tension equally throughout the abdominal wall. This is followed by skin sutures using silk, cotton or nylon material. Occasionally in severe cases when thorough hemostasis is practically an impossibility, a small rubber drain can be inserted in the lowest part of the wound. For better aesthetic results two small rubber tubes are placed on both ends



4A 4B

FIG. 4. Pendulous abdomen, front view; A, before the operation; the string shows the heavy fold; B, after the lipectomy.



5A 5B

FIG. 5. Pendulous abdomen, side view; A, before the operation; B, after the correction.

of the horizontal incision and left there for twenty-four hours. A thick pressure bandage is applied after the wound has been covered with vaseline gauze. Every second stitch is removed on the sixth day; the rest can be taken out on the tenth or the twelfth day. The patient is advised to begin exercises for the strengthening of her abdominal muscles three weeks after the operation. (Figs. 3, 4 and 5.)

CONCLUSION

In conclusion I would like to emphasize that this method is very simple in performance, gives better cosmetic results and can be executed within an hour. The choice of anesthesia is left to the surgeon. Naturally he must be guided by the general state of health of the patient. On the other hand, the method was not devised for appeasing the vanity of the patient. Its paramount aim is to remove the superfluous abdominal fat and restore the patient to a normal condition and shape, thus alleviating all symptoms due to the obesity.

In all patients treated by this method no complications were observed and no recurrence of the pendulous abdomen took place. They all conscientiously followed the given instructions and adhered to the prescribed diet.

PLASTIC REPAIR OF PROTRUDING EARS

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PROMINENT ears are an abnormal congenital defect usually due to an increase in the size of the conchal cartilage. Often the condition is an hereditary one.

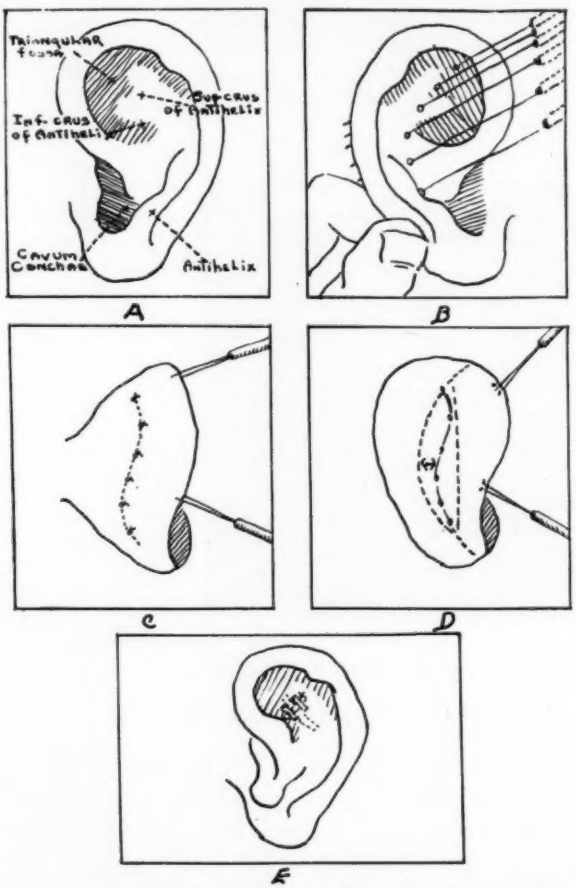

FIG. 1. A, surgical anatomy of the ear; B, hypodermic needles perforating the ear along antihelix and its superior crus; C, curved incision uniting sites of perforation on posterior aspect of the ear; D, dotted lines show removal of crescentic area of cartilage and extensions superiorly and inferiorly show where cartilage is severed from skull. Figure does not show crescentic area of skin also removed, mesial to line of incision; E, shows insertion of mattress suture on anterior aspect of ear when indicated if the inferior crus of the antihelix is not prominent enough.

Before operating the surgeon must briefly review the anatomy of the ear. The most important parts are identified. (Fig. 1A.) After the patient's ears have been sterilized with a suitable skin antiseptic and a pledget of cotton dipped in some antiseptic has been placed into the external auditory canal, and after the scalp has been draped so that the hair is covered by sterilized towels and yet both ears are visible at the same time, the operation can be done under local or general anesthesia with the patient in the supine or prone position. We prefer the supine position and intravenous anesthesia. We used six hypodermic needles and punctured the ear from the front to the back, exactly outlining the antihelix. (Fig. 1B.) The reader will notice that we omitted marking out the location of the inferior crus of the antihelix because in our patient this was well formed. We only outlined the superior crus. If the patient does not have a well defined inferior crus and a well defined triangular fossa, however, two or three extra hypodermic needles should be used and they should be inserted along the inferior crus perforating the skin and cartilage of the ear from the anterior to the posterior surface. The points of the needles where they project beyond the posterior surface of the ear can be stained with methylene blue; and when the needles are removed, the stain marks the posterior aspect of the skin and cartilage and also the posterior layer of the perichondrium. It is usually advisable to insert a couple of sutures in the margin of the ear so that the assistant may be better able to exert the proper amount of traction and bend the ear over to facilitate the surgeon who is working on the posterior aspect of the same. (Fig. 1C.)

We make a curved incision along the line of the needle points on the posterior aspect of the ear while the needles are still *in situ* or along the blue dots on the skin after the needles have been removed. This incision

2 3

FIG. 2. Photograph of patient's ears before operation.
FIG. 3. Photograph of patient's ears after operation.

corresponds exactly to the direction of the antihelix plus its superior crus. Then we work medial to this line of incision and remove a crescentic area of skin that is not more than ½ inch wide at its greatest diameter. (Fig. 1D.) After removing the skin we remove a corresponding area of cartilage (in extreme cases a larger amount of skin and cartilage will have to be removed). This excised portion of skin and cartilage is on the scalp side of the original, curved incision. In doing this we must be careful not to perforate or buttonhole the anterior skin of the ear; and if the surgeon wishes, he may facilitate the dissection of the cartilage from the anterior skin of the ear by injecting a few cubic centimeters of ½ to 2 per cent novocain solution along the line of the antihelix, that is to say, along the line where the needles were originally inserted. If the solution is injected between the anterior surface of the skin and the cartilage, very often it is introduced between the cartilage and the anterior perichondrium. Then when working from behind the ear it is easy for the surgeon to dissect the cartilage freely and to remove a crescentic area of it (including, also, the posterior perichondrium) but leaving the anterior perichondrium intact. He must then make certain that he has broken the spring of the cartilage; in other words, the surgeon must make incisions superiorly and inferiorly from the site where he removed the crescentic piece of cartilage until there is no cartilage that communicates directly from the skull to the peripheral portion of the ear. When these connections have been severed, the surgeon will notice that the ear can be easily pushed against the skull and it will not spring forward into its former, unduly prominent position. No internal sutures are necessary. We used silk but the skin along the postauricular incision can be closed with interrupted sutures of catgut because subsequent removal of non-absorbable sutures are often painful and difficult, especially in neurotics.

If the inferior crus of the antihelix is not sufficiently prominent, the surgeon should cut the posterior perichondrium and the cartilage along this line, as indicated by the accessory needles used, again avoiding injury to the anterior perichondrium and to the anterior skin of the ear. Then he might advisably produce a prominent ridge for this inferior crus by inserting a couple of interrupted sutures, using white silk, to approximate the posterior perichondrium together on each side, about 1/16 inch away from the edge of the incision. It is not

necessary to remove any cartilage in this location. We simply want to form a prominent ridge for the inferior crus so as to simulate the normal ear more closely. After the posterior auricular incision has been completely sutured, if the surgeon finds that the inferior crus of the antihelix is still not sufficiently prominent in spite of his incision of the cartilage and the use of white silk to approximate the posterior surfaces of the perichondrium, he can use a mattress suture of black silk on the outside of the ear as indicated in Figure 1E using a pledget of gauze beneath the loop of the suture on one side and beneath the knot of the mattress suture on the other side to prevent the thread cutting into the skin. This mattress suture is inserted on the front of the ear and we must make sure it does not catch any of the skin on the posterior aspect.

A strip of sterile vaseline gauze covers each postauricular incision. We then add a considerable amount of sterile gauze and mechanic's waste over both ears and cover this padding with a tight compression bandage applied like a bilateral mastoid dressing. If all goes well, the silk sutures may be removed in a week. Two or three calls after that should be sufficient for the average patient. If sufficient conchal cartilage was removed and especially if the spring of the cartilage was eliminated by incising all the remaining intact cartilage superiorly and inferiorly to the excised area, the patient should have a good cosmetic result.

Figures 2 and 3 illustrate the ears before and after operation.

SIMPLE METHOD OF BLIND NAILING FOR FRACTURED NECK OF THE FEMUR

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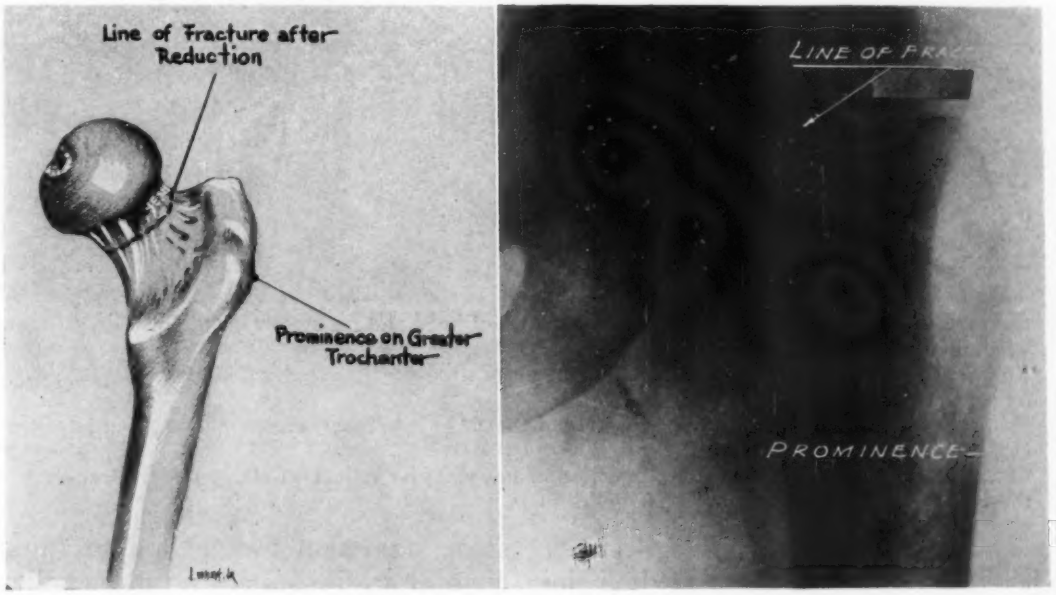
THE literature is full of methods for the insertion of Smith-Petersen nails and devices for their insertion. A method is presented herein which is simple and which can be used by the traumatic surgeon. This method has been used with very satisfactory results in many cases at the Morrisania City Hospital, New York, on the Traumatic Surgical Service and in twenty-five of my own cases.

As soon as one sees a patient with an intracapsular fracture of the neck of the femur, an immediate reduction should be done. Very often the reduction can be done under local anesthesia. After this is done the angle for insertion of the nail is determined.

STEPS IN OBTAINING ANGLE FOR NAIL INSERTION

An x-ray film (anteroposterior view) is taken with the leg 10 degrees internally rotated. (Fig. 1.) This will show a prominence on the greater trochanter from which the initial measurement is taken. It should be decided on the x-ray film where the pin should be placed and a line should be drawn on the x-ray film through the point A to B. Usually this is through the center of the neck and the head.† (Fig. 2.) The distance of this line is measured from the prominence on the greater trochanter. Usu-



1A 1B

FIG. 1. A, diagrammatic sketch showing prominence on greater trochanter from which angle for insertion of nail is measured; B, corresponding x-ray film to Figure 1A; arrow marks prominence.

† A slightly steep angle of insertion is advised as there will be less shearing force as a result when patient walks.

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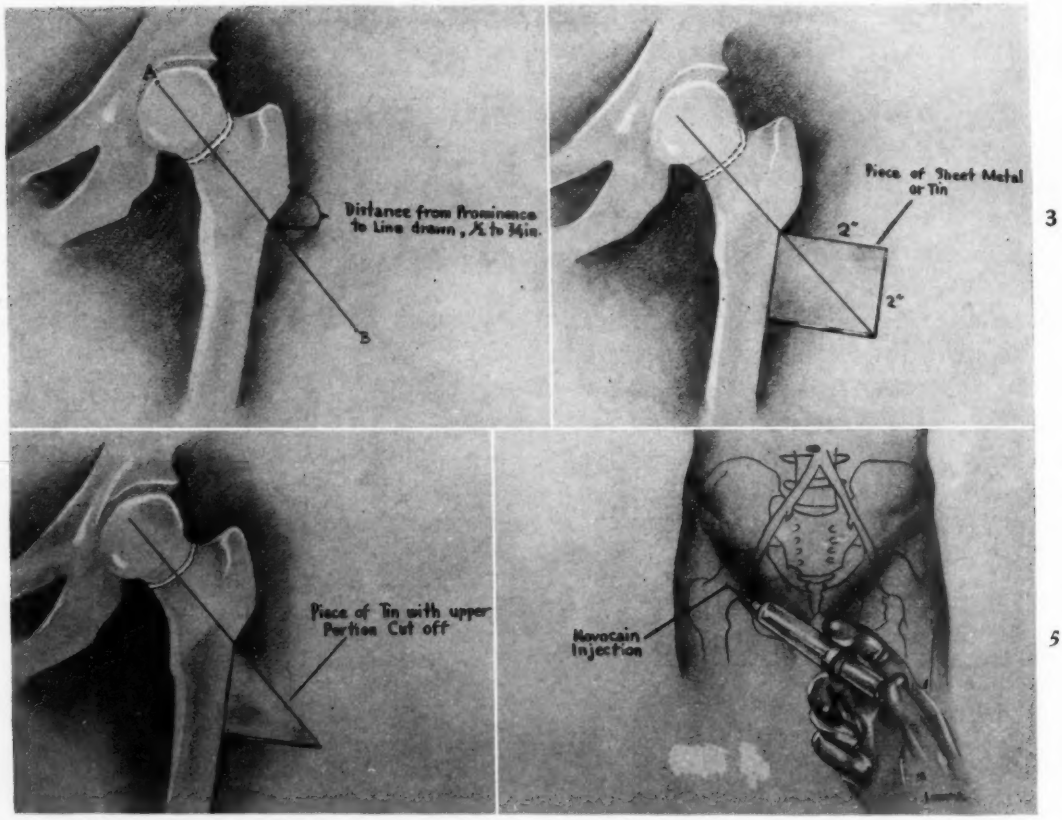
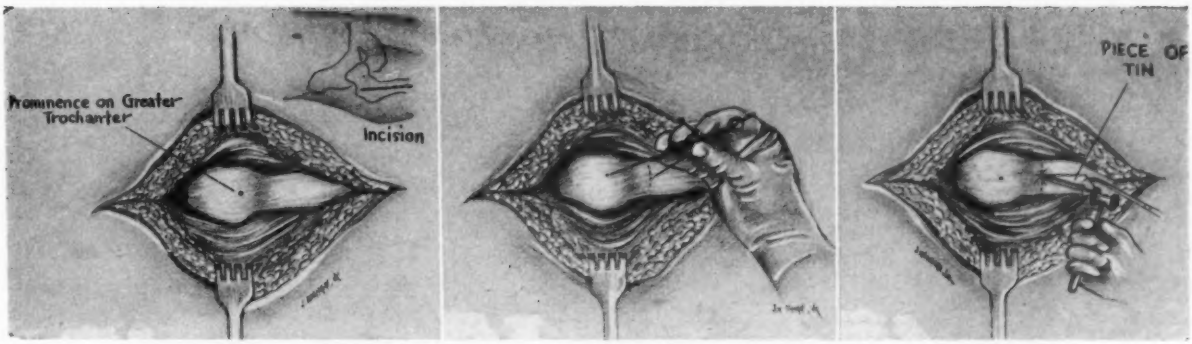


FIG. 2. Shows line (A) to (B) drawn through center of head and neck corresponding to line along which nail is to be driven.
FIG. 3. Shows 2 by 2 inch piece of tin with angle of tin flush with femoral shaft and line drawn on tin to obtain angle.
FIG. 4. Shows piece of tin with upper portion of tin cut off; portion retained gives anteroposterior angle for nail insertion.
FIG. 5. Diagrammatic sketch shows injection of novocain for reduction of hip under local anesthesia.

ally it is around ¾ inch. A 2 by 2 inch piece of sheet metal or tin is placed on the x-ray film as shown in Figure 3 and a line is drawn on the tin as shown. Then the portion of tin shaded is cut off. (Fig. 4.) The rest of the tin is thrown in with the bone instruments to be sterilized; its use is described hereafter. This piece of tin gives the correct anteroposterior angle for the insertion of the nail. At this time the length of the nail to be used is measured from the anteroposterior x-ray deducting 20 per cent for magnification. Usually a 3½ inch nail is the average.

Many men have lost sight of the fact that reduction of the hip can be done under local anesthesia using about 10 to 20 cc. of 1 per cent novocain. On a line between the symphysis pubis and the anterosuperior spine palpation for the pulsation of the femoral artery is made. Just lateral to this using a long spinal needle one goes perpendicular until the fracture line is reached as evidenced by the appearance of blood in the syringe. Then 10 cc. of 1 per cent novocain is injected. (Wait five minutes before beginning reduction.) (Fig. 5.)

The leg is then reduced by the Leadbetter method, namely, patient is on back, the thigh at right angle to the body and the leg at right angle to the thigh. One person holds the pelvis down and the operator grasps the leg under the knee, breaks up the impaction, internally rotates the thigh and extends and circumabducts thigh. Then one can test for reduction by holding the heel in the palm of the hand to see if the heel stays vertical. This is checked by



6 7 8

FIG. 6. Inset shows line of incision which is on lateral aspect of thigh mid-way between anterior and posterior surfaces of femur, the upper end of the incision overlying the prominence of greater trochanter. Enlarged view shows incision exposing bone.

FIG. 7. Shows distance from prominence to line of insertion of nail being marked off on bone with a divider.

FIG. 8. Shows Smith-Petersen nail being driven in according to angle determined by piece of tin. (Observe that piece of tin is held flush with shaft of femur.)

x-ray. If not satisfactory the reduction is repeated. A good reduction is a primary essential. The reduction is then maintained until the operative procedure is finished by having an orderly hold the leg with slight traction at a 10-degree internal rotation.

TECHNIC

Choice of Anesthetic. With elderly individuals the entire procedure has been done under local anesthesia using 1 per cent novocain as previously mentioned. In other cases spinal or a combination of local and nitrous oxide anesthesia have proven satisfactory. One has to decide the anesthetic from the age and condition of the patient.

Operative Procedure. The patient is placed on his back on an ordinary operating table. Reduction is maintained by having an orderly hold the leg with a little traction and slight internal rotation all during the operation as mentioned before. A 4 to 5 inch incision is made overlying the prominence of the greater trochanter and continuing downward along the thigh on the lateral aspect of the thigh mid-way between anterior and posterior surfaces of the femur and carried down to the bone. (The skin incision should be outlined before draping with the back of the knife.) (Fig. 6.) The bone is bared with periosteal elevator up to the prominence on the greater trochanter and for a distance of 4 to 5 inches below this. (Usually there is very little bleeding.) With a divider the distance is measured which was measured on the x-ray film, namely, the distance from the prominence on the greater trochanter* to the point where the nail should go in, (corrected for magnification) and the operator marks this off with the divider on the femur. (Fig. 7.) (Since x-ray magnifies 20 per cent, one-fifth of the distance is subtracted from the total distance measured on the x-ray film.) A Dooley-Smith-Petersen nail is used in all cases† and is driven in a small distance perpendicular to the bone (about ¾ inch) at the point marked off by the divider. The piece of tin is made use of to get the angle by placing it at the point marked off by the divider as in Figure 8 and holding the tin flush with the shaft of the femur. The pin is gently tapped down to this angle by a mallet. This gives the correct anteroposterior angle. A Steinmann pin is run along the neck anteriorly until it strikes the head; this gives correct lateral angle. The nail is gently tapped down parallel to this and driven in a portion of the way; the position is checked by x-ray. If satisfactory the nail is driven in all the

* This is easily palpated with gauze over finger. It is not necessary to clear the prominence completely but one point of the divider is placed on most prominent part.

† Vitallium® made by Austenal Laboratories, New York, N. Y.

9 10

FIG. 9. Anteroposterior view.
FIG. 10. Lateral view of hip with Smith-Petersen nail *in situ;* method described in this article was used.

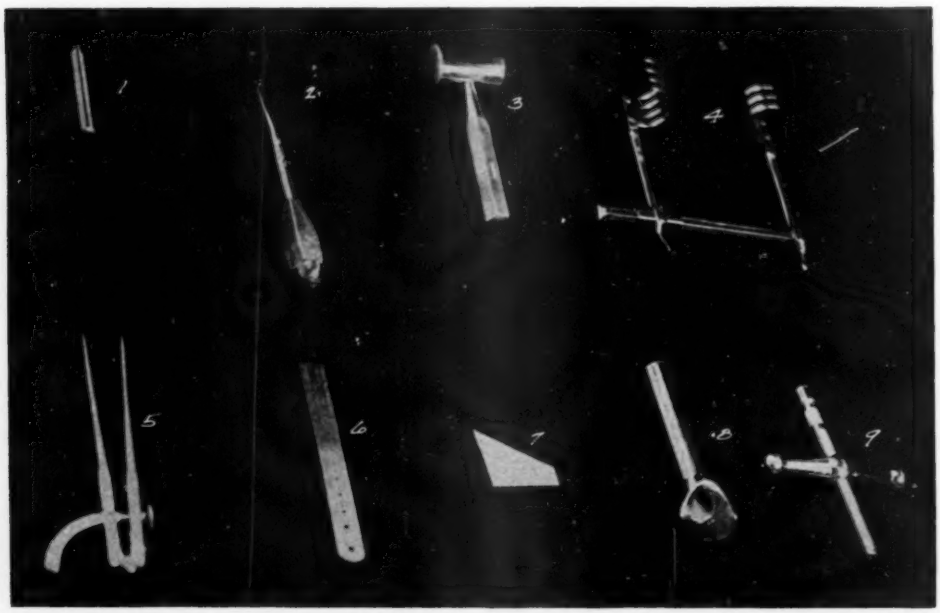


FIG. 11. Shows instruments used in the procedures: (1) Dooley-Smith-Petersen nail; (2) periosteal elevator; (3) mallet; (4) laminectomy, self-retaining retractor which works very well as muscle retractor; (5) divider; (6) Zimmer metal ruler; (7) piece of tin cut to desired angle; (8) impactor; (9) extractor.

way; the impactor is used to impact the fragments. The angle should be correct if the method is followed exactly. Very rarely the nail may have to be tapped down slightly as judged by the x-ray but I have never had to remove and reinsert it. The wound is closed using continuous chromic No. 1 suture for muscle and fascia and clips for skin. (Figs. 9, 10 and 11.)

The patient may be allowed up as soon as possible, with crutches and no weight-bearing. (I have had several patients get up the day after surgery.) Weight-bearing is not allowed until there is callous formation present as evidenced from the x-ray. The whole operative procedure does not take longer than from thirty to forty-five minutes, excluding time for roentgen.

COMMENT

Considering the many patients on whom I have seen this method used and the number of cases in which I have used other technics, the one described herein is not difficult to execute and one has a definite idea about the angle of the nail before beginning the procedure.

SUMMARY

A simple method of blind pinning of fractured neck of the femur is presented herewith in which accurate pinning can be done without elaborate set-up.

Acknowledgment is made to Dr. Emmet Dooley, former chief of service, and Dr. Thomas O'Kane, present chief of the Traumatic Surgical Service of Morrisania City Hospital where this method was first used.

APPENDICITIS IN CHILDREN*

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LADD and Gross[3] open their chapter on appendicitis in infancy and childhood by stating, "Inflammation of the vermiform appendage is the most common lesion requiring intra-abdominal surgery in childhood." There is no more perplexing problem for the surgeon than that of distinguishing those conditions in infancy and childhood which require immediate surgical intervention from those in which surgery is contraindicated or unwarranted.

TABLE 1

DISEASES WHICH MAY SIMULATE ACUTE APPENDICITIS IN INFANCY AND CHILDHOOD

(1) Respiratory System:
- Upper respiratory: acute tonsilitis, otitis media, acute pharyngitis, cervical adenitis
- Pneumonia
- Pleurisy (diaphragmatic)

(2) Musculoskeletal System:
- Osteomyelitis of the ileum or femur, spinal column disease (tuberculosis, spondylitis, or lateral curvature)
- Fibrositis of abdominal musculature, psoas abscess, hernia
- Herpes zoster
- Rheumatic fever
- Poliomyelitis

(3) Urogenital System:
- Pyelitis, kinking of ureter, ureteral calculi, urethral stricture, torsion of a testicle, orchitis

(4) Gastrointestinal System:
- Cyclic vomiting, gastroenteritis, bacillary dysentery, ulcer of Meckel's diverticulum
- Peritonitis, retroperitoneal abscess

(5) Hemopoietic System:
- Hemolytic crisis
- Henoch's purpura

(6) Lymphatic System:
- Tuberculosis or simple inflammation of the abdominal lymph nodes (retroperitoneal, mesenteric or iliac)

Acute appendicitis comprises two-thirds of all the acute conditions of the abdomen irrespective of age of the patient.[1,4] Watkins stated that 8.6 per cent of 19,401 cases of appendicitis in the Cleveland area occurred in children under ten years of age.[5]

It is the purpose of this paper to discuss 100 patients ten years of age or younger on whom a preoperative diagnosis of acute appendicitis had been made. These patients were found in a general hospital of 250 beds between the years 1945 and 1948.

It is essential to emphasize that abdominal pain may frequently precede or coincide with the onset of childhood disease remote from the abdomen. Some of the symptom complexes which may simulate acute appendicitis in the child are shown in Table 1.

The patients in our series have been classified with respect to age, sex, admission temperature, clinical findings, leukocytosis and duration of hospital stay and complications. Each patient in the series had a preoperative diagnosis of acute appendicitis. The series was divided into four groups from the microscopic pathologic diagnoses. The first group of thirty-eight patients had gross and microscopic findings indicating acute inflammation of the appendix (i.e., edema of the wall, polymorphonuclear leukocytic infiltration of the muscularis and purulent foci of inflammation in the mucosa and serosa). In the second group, of twenty-two patients only minimal evidence of new or old inflammatory process was present in the appendix microscopically (i.e., early inflammatory changes in the serosa and muscularis, edema, eosinophilic infiltration and chronic fibrosis with obliteration of the lumen). (Fig. 1.) The third group included those seven patients in whom either gross lesions were demonstrated at operation or microscopic ones found in the appendix which could not be classified in the first two groups (i.e., Oxyuris vermicularis of the appendix, fecalith without inflammation or mesenteric adenitis). (Fig. 2.) The

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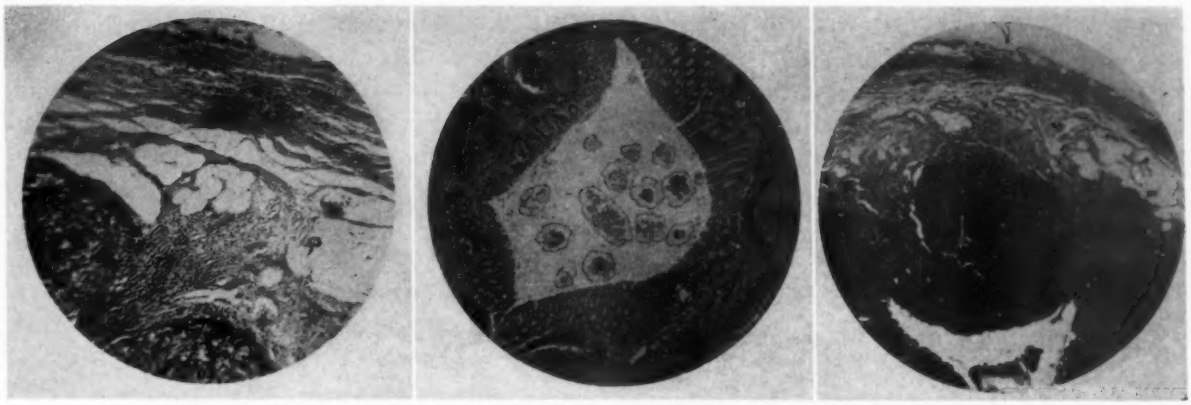

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FIG. 1. Cross section of appendix showing fibrous tissue replacement of muscularis and submucosa with eosinophile infiltration; subacute appendicitis (medium power).
FIG. 2. Cross section of appendix showing lumen filled with Oxyuris vermicularis (low power).
FIG. 3. Cross section of appendix showing hypertrophied lymph follicles and lymphocytic infiltration of submucosa; lymphoid hyperplasia of appendix (low power).

thirty-three patients in the last group had normal appendices with the usual lymphoid hyperplasia of childhood (i.e., hyperplasia of the follicles of the mucosa, lymphocytic infiltration of the wall and no inflammatory changes). (Fig. 3.)

TABLE II
SEX DISTRIBUTION

Age (yr.)	Males	Females	Total
0–1	0	0	0
1–2	2	0	2
2–3	3	1	4
3–4	4	2	6
4–5	4	3	7
5–6	5	7	12
6–7	7	6	13
7–8	6	8	14
8–9	10	10	20
9–10	10	12	22
Total	51	49	100

Age and Sex Distribution. In the series of 100 patients there were fifty-one males and forty-nine females ranging in age from twenty-two months to ten years. The distribution by age and sex is shown in Table II. Further subdivision by pathologic diagnosis is shown in Table III. It is interesting to note that there were twenty-three males and fifteen females with acute appendicitis; 44 per cent of this group were between the ages of eight and ten years. The second group with subacute appendicitis was made up of twenty-two patients, eight males and fourteen females, of whom 50 per cent were over eight years of age. There were five females and two males in the miscellaneous group. Oxyuris vermicularis of the appendix was present in one male and three females. Mesenteric adenitis was diagnosed at operation in one child of each sex. In only

TABLE III
DISTRIBUTION BY AGE AND PATHOLOGIC DIAGNOSIS

Age (yr.)	Acute Appendicitis	Subacute Appendicitis	Miscellaneous	Lymphoid Hyperplasia	Total
0–1	0	0	0	0	0
1–2	1	0	0	1	2
2–3	2	0	0	2	4
3–4	3	2	0	1	6
4–5	1	1	1*	4	7
5–6	4	1	4†	3	12
6–7	5	2	0	6	13
7–8	5	5	0	4	14
8–9	10	4	0	6	20
9–10	7	7	2	6	22
Total	38	22	7	33	100

* Mesenteric adenitis
† Oxyuris vermicularis of the appendix (2), fecalith of the appendix and mesenteric adenitis.

one patient was there a fecalith present in the appendix which could explain the preoperative symptoms which had led to a diagnosis of acute appendicitis. The last group of thirty-three patients with normal appendixes was made up of nineteen males and fourteen females; 40 per cent were in the eight to ten-year age group.

Admission Temperature. The admission temperature in the 100 patients ranged from 98.6° to 106°F. The average temperature on admission was 100.4°F.; in patients with acute appendicitis the average temperature was 100.2°F. Five had ruptured appendixes and the average temperature was 102°F. (Table IV.)

The average admission temperature of the patients with normal appendixes was 99.6°F. The average in the miscellaneous group was 100.1°F.

The children with pathologic processes in the appendix had lower admission temperatures than those in whom no inflammation was satisfactorily demonstrated, except in those cases with ruptured appendixes. However, one must remember that we are dealing here with *children* ten years of age or younger who have very labile temperature responses to any infectious process.

TABLE IV
ADMISSION TEMPERATURE

Pathologic Diagnosis	Temperature						
	98°–99°F.	99°–100°F.	100°–101°F.	101°–102°F.	102°–103°F.	103°–104°F.	104°F. up
Acute appendicitis	1	10	11	6	6	3	1
Subacute appendicitis	2	13	6	0	1	0	0
Miscellaneous	1	3	1	1	0	1	0
Normal appendix	2	10	10	4	4	0	3
Totals	6	36	28	11	11	4	4

TABLE V
PHYSICAL FINDINGS

Pathologic Diagnosis	Point Tenderness		Rebound Tenderness		Rigidity	
	No.	Per cent	No.	Per cent	No.	Per cent
Acute appendicitis	20	52.5	24	65.6	20	52.5
Subacute appendicitis	3	13.6	5	22.7	4	18.2
Miscellaneous	4	57.2	3	43.0	1	14.3
Normal appendixes	12	36.4	5	15.2	7	21.3
Totals	39	39.0	37	37.0	32	32.0

Clinical Findings. Our 100 patients were investigated with respect to point tenderness, rebound tenderness and muscle rigidity. The results are summarized in Table V. It is significant that more than 50 per cent of the patients with a pathologic diagnosis of acute appendicitis showed all three signs of a localized intraperitoneal inflammatory process. Furthermore, all those patients with oxyuriasis of the appendix had localized and rebound tenderness.

Leukocytosis. The average leukocyte count of all the patients in our series was 11,357, ranging between 4,500 and 27,500. The differential leukocyte count averaged 71 per cent polymorphonuclear leukocytes and 29 per cent lymphocytes. The group of patients with confirmed acute appendicitis averaged 14,643 total leukocytes, with 77 per cent polymorphonuclear leukocytes and 23 per cent lymphocytes. The total white count average of those with

subacute findings was 10,842, with a differential count of 57 per cent polymorphonuclear leukocytes and 43 per cent lymphocytes. The miscellaneous group of patients presented an average white count of 10,247 and a differential count of 71 per cent polymorphonuclear leukocytes and 29 per cent lymphocytes. The patients with normal appendixes averaged 12,898, with 74 per cent polymorphonuclear leukocytes and 26 per cent lymphocytes.

It is evident that the children with acute appendicitis had an average white count higher than those children in any of the other groups.

Hospital Stay and Complications. The average hospital stay in our series was 7.6 days; the minimum stay was 3 days and the maximum, twenty-eight days. There was no significant difference between the four groups of patients. Those five patients who were hospitalized for more than nine days had one of the complications described hereafter.

The first postoperative complication occurred in an eight year old girl whose pathologic diagnosis was subacute appendicitis. She had an unexplained low grade postoperative temperature for thirteen days and was discharged on the fifteenth day. Her temperature had been normal for the last two days and she had received 50 gm. of sulfadiazine during her illness. No cause for the temperature elevation could be found.

A nine year old boy with a confirmed diagnosis of acute suppurative appendicitis experienced a chill on the first postoperative day and developed a spiking temperature for two days. No urinary or pulmonary infection could be found. He was treated empirically with sulfadiazine and was discharged on the eleventh day.

A five year old boy with acute appendicitis developed a spiking temperature to 104°F on the fifth postoperative day. Paralytic ileus became apparent on the seventh postoperative day and despite penicillin, streptomycin and 500 cc. of whole blood the temperature remained elevated until the thirteenth day. He was discharged on the twenty-first day with a normal temperature and was apparently well.

As our fourth complication bilateral lobar pneumonia developed on the second postoperative day in a nine year old boy with acute appendicitis. Paralytic ileus appeared on the third postoperative day and after treatment with suction 900 cc. of whole blood, penicillin and sulfadiazine the child was discharged on the sixteenth hospital day, apparently well.

TABLE VI
INCIDENCE OF EMERGENCY OPERATION

Pathologic Diagnosis	Emergency Operation		Elective Operation		Total
	No.	Per cent	No.	Per cent	
Acute appendicitis....	27	71	11	29	38
Subacute appendicitis	5	23	17	77	22
Miscellaneous.....	1	14	6	86	7
Normal appendixes...	9	27	24	73	33
Totals.....	42	42	58	58	100

The last complication occurred in a seven year old boy with acute appendicitis who developed a localized intraperitoneal abscess fourteen days postoperatively. The abscess was drained and sulfathiazole was administered orally and parentally. He improved rapidly and was discharged on the twenty-eighth hospital day.

Incidence of Emergency Operation. Forty-two patients in our series were operated upon as emergencies. In twenty-eight (64.3 per cent) the pathologic diagnosis was acute appendicitis; in nine cases (21.4 per cent) the diagnosis was appendix. Five patients (11.9 per cent) had subacute appendicitis and one (2.4 per cent) had mesenteric adenitis at the time of operation. It is encouraging to note that only 35.4 per cent of the patients who underwent emergency operation were diagnosed as having normal or subacute appendicitis.

However, only 33 per cent of all operative cases had histologically normal appendixes. This agrees favorably with the report of Joffee and Wells[2] who found 27.5 per cent of normal appendixes in the 1,000 cases of appendicitis they report in all age groups. They suggest that only about 15 to 20 per cent of the appendixes removed in a good surgical practice should be normal. (Table VI.)

SUMMARY

The evaluation of 100 patients ten years of age or younger in whom a preoperative diagnosis of acute appendicitis had been made brings forth several points.

1. In only 38 per cent of the patients in our series was the preoperative diagnosis confirmed by the pathologist. Of these patients 64.3 per cent were operated upon as emergencies.

2. There was no significant difference in the age and sex distribution.

3. The average admission temperature of the patients with pathologically acute appendicitis was lower than the average for patients with normal appendixes. Those patients with ruptured appendices had the highest average admission temperature of the whole series.

4. The local signs of acute intraperitoneal inflammation were more pronounced in those cases with a pathologically acute appendicitis and seem to be the most reliable findings in establishing a diagnosis of acute appendicitis in children.

5. The higher leukocytoses were found in the group of patients with pathologically acute appendicitis but the group had the widest range in white blood count. We believe that varying degrees of hydration of these patients might explain this phenomenon.

6. Five per cent of the patients in our series developed postoperative complications but there were no deaths.

7. A ten year old girl was operated upon for acute appendicitis. She had a normal appendix and a ruptured follicle cyst of the right ovary.

CONCLUSIONS

1. Any local or systemic disease with abdominal pain may simulate acute appendicitis in children.

2. Admission temperature and leukocytosis are of limited value in establishing a diagnosis of acute appendicitis in a child, whereas point and rebound tenderness with rigidity should be the principle bases for the diagnosis.

3. A laparotomy is mandatory if after twenty-four hours' observation of a child with abdominal pain there is any reasonable doubt in the mind of the clinician that one of these systemic diseases rather than acute appendicitis is the cause.

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A NEW APPROACH IN THE SURGICAL TREATMENT OF TUMORS OF THE PINEAL REGION*

THE POSTERIOR CORONAL FLAP

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THE occipital unilateral flap has been adapted for tumors of the pineal region and is advocated mainly by Van Wagenen, Dandy and Horrax. After the dura flap is turned transhemispheric and/or a mid-saggital approach to the tumor through the posterior aspect of the corpus callosum has been employed, the procedure is combined at times with a total occipital or a partial occipitoparietal lobectomy.

It is obvious that removal of the tumor by those methods may be greatly hampered or may even be impossible because of several yet unsolved problems. In the first place the degree of extension of the tumors of the pineal region to nearby areas at either side of the mid-sagittal plane cannot be entirely foreseen from the clinical and ventriculographic findings. Therefore, one needs a type of exposure in which the third ventricle, hypothalamus and infratentorial region can be visualized, explored and operated upon if necessary.

The structure of the tumor mass is unpredictable until it is directly observed. When small and cystic or small and of rather hard consistency and well limited, the removal does not offer great difficulties. Very often, however, besides the considerable size, marked vascularization adds to the surgical risks. One needs, then, an approach to permit access to all surfaces of the tumor for adequate clamping, coagulation, dissection and retraction of the vascular supply.

Not infrequently the vein of Galen, its main tributaries, and the occipital internal vein may seriously interfere with the removal of the tumor. This happens when those veins are totally or partially included in the tumor mass, intimately attached to it or are just in the way, not permitting a safe extirpation. The vein of Galen draws the blood from the choroid plexus and the greater part of both hemispheres except the cortex and its integrity is undoubtedly essential to life. An exposure to allow bilateral visualization of the vascular system of this region would permit a proper retraction and dissection with a more reasonable margin of security than one has with the present methods in use.

The difficulties noted are some of the reasons for the very high mortality in operations for pineal region neoplasms. An attempt is made to overcome those problems by way of a new surgical procedure.

The results will be presented after follow-up of the cases for one year from the time of operation. It has been used in two cases so far.

DIAGNOSIS AND MANAGEMENT

In tumors of the pineal region the neurologic findings result from the encroachment of the neoplastic mass posteriorly in the mid-plane compressing the sylvian aqueduct. The signs are secondary to disturbance of the oculomotor apparatus, pyramidal tracts, cerebellum and its tracts. Occasionally one may find eighth nerve dysfunction.

The tumor may cause partial or complete obstruction to the outflow of cerebrospinal fluid from the lateral and third ventricles giving rise to a variable degree of hydrocephalus.

* From the Neurosurgical Services of Lincoln Hospital and Lenox Hill Hospital, New York, N.Y. Presented at the Second South American Neurosurgical Congress, Santiago, Chile, April, 1947.

Probably one of the most common of the early signs is an absence or limitation of upward gaze which also may be unequal in the two eyes.

The appearance and degree of this and other neurologic symptoms vary with the size and/or length of time the tumor has been present.

As in any other brain neoplasm the eye ground changes are not in relation to the degree and duration of the increased intracranial pressure and it is possible to find a large neoplasm of the pineal region with a considerable amount of internal hydrocephalus without papilledema and minimal discomfort to the patient.

Once the final diagnosis is made, it is necessary to decide on the type of therapy. It is possible to carry out a primary surgical treatment or x-ray therapy with or without subtemporal decompression which will be followed by the surgical removal of the tumor a few weeks or months later. When surgery is the treatment of choice, no single approach is entirely suitable. The most widely used are the transcallosal approach of Dandy and the transventricular approach of Van Wagenen, as outlined by these authors, or in combination with and supplemented by a partial occipitoparietal lobe resection as reported by Horrax.

Position. The patient is placed in a cerebellar position with the table tilted in a 30 to 35 degree angle in an anteroposterior direction, with the head higher than the feet.

Anesthesia. Local anesthesia is advised, especially when an extension of the tumor to the hypothalamus is suspected. Very often if one is forced to work in or near the third ventricle the change in the alertness, consciousness and cooperation of the patient will determine how far to go or when to stop.

If the patient is to be under general anesthesia, probably the best second choice is endotracheal ether with sodium pentothal induction.

Ventriculography. Whether or not a final diagnosis of neoplasm of the pineal region can be done clinically, a confirmatory ventriculography should always be carried out if possible. Ventriculograms will give new valuable information in relation to the probable size, location and extension of the tumor.

It is best to do the ventriculograms in this type of case through anterior frontal bilateral burr holes. In this manner the evacuation of ventricular fluid is much easier.

PROCEDURE

1. After the patient is in position, the operative field is sterilized.

2. The scalp flap is outlined. Its shape is like that of a horseshoe. It starts at a point medial to the mastoid tip and crosses over the midline, above the precentral gyrus to a point medial to the other mastoid tip. The open end of such a flap is directed toward the foramen magnum. (Figs. 1 and 2.)

3. After local infiltration and adequate draping the outlined incision is carried down to the bone. The scalp flap is flexed on a line running 1 cm. caudal to the inion and extending from mastoid to mastoid tip.

4. A right occipito-parietal bone flap is turned in the usual manner and hinged over the posterior half of the temporal muscle. The bone flap should extend to a proper distance from the superior saggital and the transverse sinus. At continuation a dural flap is turned with its base at a safe distance from the superior saggital sinus. During this step small veins from the dura to the cortex may have to be clipped, coagulated and sectioned. The same method is used for the left side. Whether the left bone and dura flap should be carried out at this point or after the right side exposure is proved to be inadequate, may be doubtful in the beginning.

When an internal hydrocephalus is present and the ventricles emptied (with cerebellar position, Step 5) a vein going from the cortex to the dura or falx may lacerate in the covered left side as the collapse of the ventricles produces a forward movement of the posterior half of the brain. The complications resulting

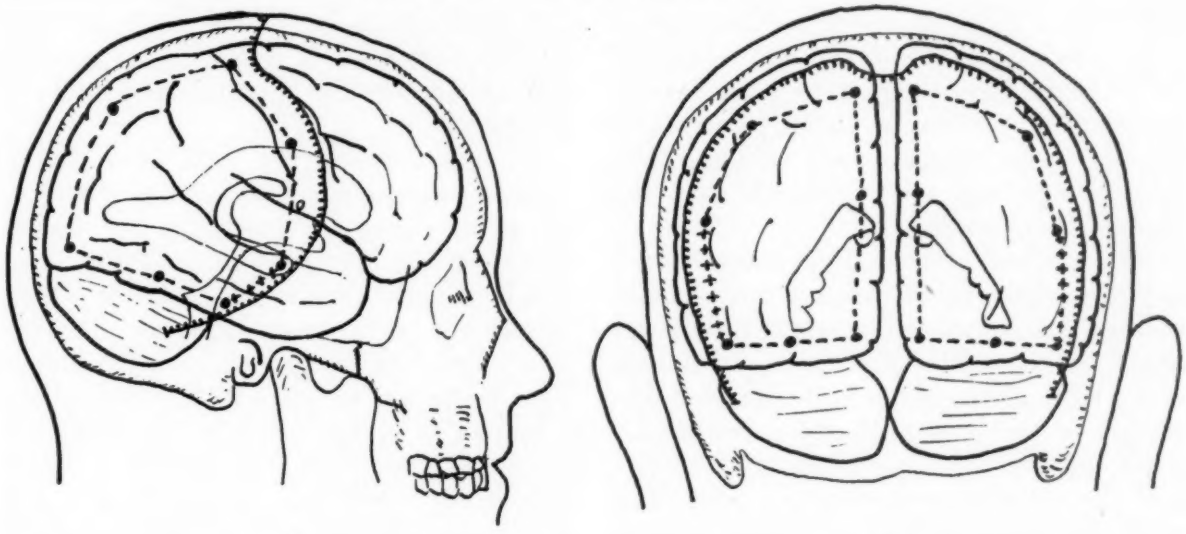
from such incidence are obvious. This will not occur in a simultaneous bilateral approach because one can easily see such veins and take adequate precautions. The trauma added by a small bone and dural flap increases the surgical risk very little; therefore, a bilateral simultaneous flap is indicated in general.

The bony openings are separated by an osseous band extending over the midline from the suboccipital region to the rest of the skull. This band serves as protection to the superior longitudinal sinus.

5. The ventricles are drained slowly from the anterior frontal burr holes used for previous ventriculography by way of a ventriculogram needle or a fine rubber catheter. With the collapse of the ventricles the occipital and parietal lobes tend to separate from the midline and move anteriorly. As this occurs, the small veins from the falx to the cortex are clipped until the corpus callosum is exposed.

6. Several or all of the following maneuvers can be carried out depending on the exact location, size and extension of the tumor: transcallosal approach, transventricular approach and section of the tentorium laterally to the straight sinus. They are done, according to the indications or needs of each moment, first on the right side, then on the left, alternating in any order or using one, some or all of the mentioned steps.

7. The tumor is removed and hemostasis aided with absorbable gauze and fibrin foam is done.



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FIGS. 1 and 2. Diagram of the posterior coronal flap for pineal region tumors: ⊤⊤⊤⊤ scalp incision; – – – bone flap; + + + base of bone flap; • burr hole.

8. The ventricles are filled with saline or the previously removed ventricular fluid. They are refilled enough to keep the brain cortex free from harmful depression which may produce a vascular thrombosis.

9. Closure is done in layers as usual.

10. A rubber catheter is left in the ventricles for postoperative drainage and a dry dressing is applied. During the operation fluids (saline, plasma, blood) are given intravenously as indicated.

SUMMARY

Operations for tumors of the pineal region are briefly mentioned.

Some clinical and surgical observations on neoplasms of the pineal region are outlined.

A new operation for removal of tumors of the pineal region is presented.

CONCLUSION

A new technic for removal of neoplasms of the pineal region has been found to have several advantages over the methods used today. This new procedure improves the surgical treatment of tumors of the pineal region.

HEMORRHOIDS

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THE number of operations for hemorrhoids are numerous and therefore the decision on the type procedure to use is not an easy one to make, particularly for the more inexperienced surgeon. The simpler methods are ordinarily not the procedures of choice.

The method presented requires little if any dissection and clamps are not actually used in the operation because it is believed that careless and injudicious use of clamps along with unnecessary and extensive dissection of the part probably accounts for some of the bad postoperative results and the dreaded postoperative pain. The method appears radical but is still as conservative as possible in its attempt to produce the most permanent results.

The principal features about the procedure are the following, namely, extensive dissection is not encouraged; no clamps are used for the actual operation and postoperative pain is reduced to a minimum.

After dilating the rectum under anesthesia certain patients present a prolapse of the lower part of the rectal mucosa and of internal hemorrhoids along with some external hemorrhoids and marginal varicosities. This I believe is true in those individuals who give a long-standing history of rectal bleeding and constipation assuming, of course, that other conditions have been excluded such as carcinoma, rectal polyps, etc. The condition appears to be more extensive than the rosette often spoken about and on more careful examination one will quite often note the abscence of varicosities and a free area of simple prolapsed mucosa between the groups of hemorrhoids. These free areas are usually present at the midline both on the anterior and posterior protion of the anal opening. The procedure herein described is best applicable in this type of case.

A brief discussion of the anatomy concerning hemorrhoids is worthy of note at this time before the operative procedure is presented.

Developmentally the anal canal has a twofold origin, an ingrowth from the skin, the proctodeum and secondly the downgrowth of the hindgut toward the surface. The anal membrane is the partition which divides the proctodeum from the hindgut. This membrane disappears, as a rule, leaving a white line to mark its location which is known as Hilton's line or the pectinate line. This line is of considerable surgical importance when one considers that approximately 85 per cent of all proctologic conditions occur in this area.

Particular points to be kept in mind of surgical importance about Hilton's line with reference to hemorrhoids are the following.

1. The external sphincter replaces the internal sphincter at this level.

2. The areas of distribution of the cerebrospinal and sympathetic nerves meet at Hilton's line. The cerebrospinal nerves (inferior hemorrhoidal) supply the area distal to the line and the sympathetics supply the mucous membrane proximal to the line. Because of this nerve distribution the mucous membrane above the line is relatively insensitive while the skin below is quite sensitive.

3. True hemorrhoids are usually situated above Hilton's line but can occur below the line. The true hemorrhoids are varicosities of the superior hemorrhoidal veins and the arrangement of the masses are usually at positions corresponding to three to seven to eleven on a clock face corresponding to the primary branches of the superior hemorrhoidals. Very infrequently will the varicosities occur at six or twelve o'clock (position of secondary

branches of superior hemorrhoidals) and it is for this reason that quite often the mucous membrane in that area can be left intact. (Fig. 1.)

4. External piles form a bluish cushion of veins in the skin around the anus.

5. The internal and external varieties are quite often connected by small veins crossing Hilton's line in the patient with a long-standing history.

OPERATIVE PROCEDURE

The usual routine is carried out for preparing and cleaning out the patient before operation.

The anesthesia of choice is the saddle type of spinal anesthesia in which the spinal tap is done with the patient sitting up over the side of the operating table with his feet on a stool and his knees slightly higher than his hips. His arms are folded with the elbows resting on the knees and the head is well flexed.

The spine is tapped in the fourth space-collecting 1 cc. of spinal fluid in a 120 mg. vial of crystalline novocain. One-half of the mixture is discarded after dissolving the crystals and the remaining half is injected (60 mg.) very slowly in order to prevent the creation of currents. The patient is then to sit quietly for five minutes.

The patient is then put in the lithotomy position and the rectum is dilated gradually and carefully.

If the varicosities extend across the midline anteriorly and posteriorly, the prolapsed mass is pulled down with Allis

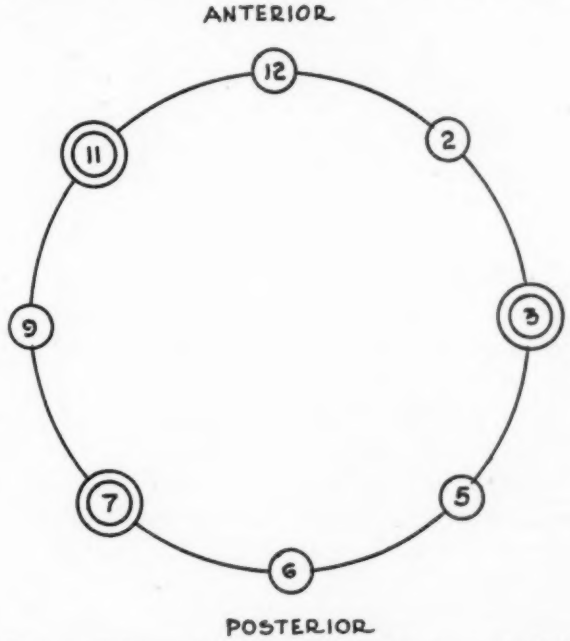

FIG. 1. Primary branches of superior hemorrhoidal vein: 3, 7, 11; secondary branches of superior hemorrhoidal vein: 12, 2, 5, 6, 9.

clamps and is bisected by making an incision at six and twelve o'clock through the mucous membrane and down to the external sphincter. The incisions are made between two straight clamps that are applied radically on the hemorrhoidal mass. The points of these clamps are just outside the external sphincter. The pur-

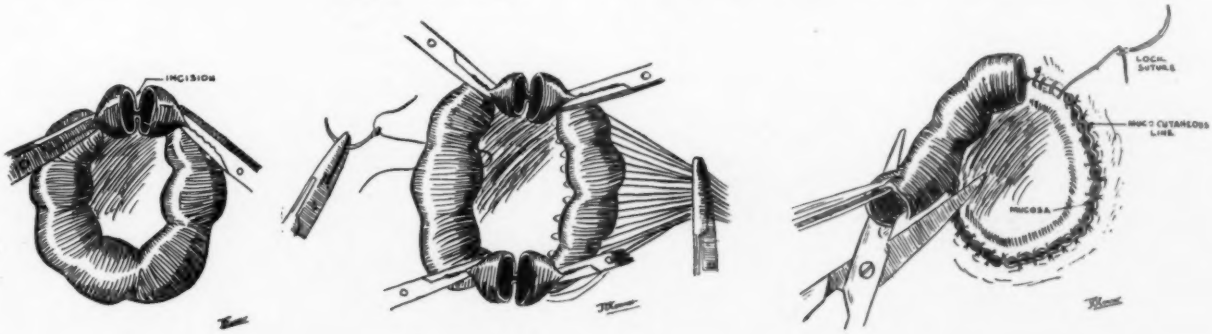

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FIG. 2. Shaded area represents prolapsed tissue including mucosa with internal hemorrhoids.
FIG. 3. Interrupted mattress sutures applied.
FIG. 4. Running lock suture applied.

The area of anesthesia will include the entire rectum, anus and skin of the perianal region and perineum, posterior surface of the scrotum and coccygeal region.

pose of these clamps is for suspension only after discarding the Allis clamps which had originally been used for the same reason. (Fig. 2.)

The prolapsed mass is then kept suspended by maintaining the straight clamps perpendicular to the anal opening (assistant holding clamps) and interrupted mattress sutures are applied at the base of the mass using fine chromic gut. The sutures are started at six o'clock and are continued up toward twelve o'clock using the thumb and index finger as guides and always staying outside the external sphincter with sutures. These sutures are applied just inside the mucocutaneous junction externally and internally at the upper portion of the prolapsed mucosa which includes the varicosities. (Fig. 3.)

After this line of suture has been secured, the long end of sutures are retracted laterally and the varicosities and the prolapsed tissue are cut away with scissors being careful to avoid cutting the sutures. The suspension clamps come away with the prolapsed tissue. Then a hemostatic lock stitch is run down over the raw surface left exposed getting the mucous membrane on the inner side and the mucocutaneous junction on the outer side. (Fig. 4.)

The same procedure is carried out on the other half of rectum starting from below and then applying the hemostatic suture from above down so that bleeding will not interfere with the application of the sutures after the mass is cut away.

If the mucous membrane at six o'clock and twelve o'clock are not involved in the pathologic process, the suspension clamps can be applied on either side of the midline thereby leaving some mucous membrane intact.

Vaselinized strip is then applied in the rectum and some to cover the raw sutured surface.

The patient is given morphine for the first twenty-four or forty-eight hours. Mineral oil is given twice a day for the first five days. He can usually be allowed up the second day and take tub baths on the fourth day. The vaselinized strip is allowed to come out with the patient's first bowel movement or can be removed sooner if it is distressing to the patient.

The method has been applied for the last eight years on many cases and the results and follow-ups have been very gratifying.

SUMMARY

1. A simple amputative method for hemorrhoids and prolapsed mucosa is presented discouraging the use of clamps and extensive dissection.

2. Postoperative hemorrhage is obviated by the use of the hemostatic suture.

3. By not using clamps one limits or controls the possibility of unnecessary traumatization of perirectal tissue and rectal sphincter thereby keeping postoperative pain at a minimum.

4. Postoperative annoying skin tabs are avoided.

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Obstetric Clinic

THE woman about to become a mother or with a new-born infant upon her bosom, should be the object of trembling care and sympathy wherever she bears her tender burden, or stretches her aching limbs. The very outcast of the streets has pity upon her sister in degradation, when the seal of promised maternity is impressed upon her. The remorseless vengeance of the law brought down upon its victims by a machinery as sure as destiny, is arrested in its fall at a word which reveals her transient claim for mercy. The solemn prayer of the liturgy singles out her sorrows from the multiplied trials of life, to plead for her in her hour of peril. God forbid that any member of the profession to which she trusts her life, doubly precious at that eventful period, should hazard it negligently, unadvisedly or selfishly.

OLIVER WENDELL HOLMES

2nd of the Series

POSTPARTUM HEMORRHAGE

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HEMORRHAGE is the most frequent cause of maternal death and a common contributor to puerperal death from other causes. Further, death at the time of delivery is due more often to hemorrhage than to any other cause. It is not our intention to study all the circumstances which contribute to hemorrhage at the time of delivery. Even spontaneous birth may be followed with great loss of blood. Placenta previa and lacerations of the genital tract will be discussed elsewhere. Proper management of the third stage of labor is perhaps the obstetrician's greatest responsibility since the greatest number of deaths from hemorrhage are due to abnormalities of placental separation and uterine atony. Postpartum hemorrhage is not a good term since hemorrhage is often formidable before the third stage of labor is completed. A better term might be third stage hemorrhage.

CASE 1. A multipara who had seven normal full term deliveries was admitted to the hospital in good labor at term. Within a few hours spontaneous delivery occurred. A slight laceration was repaired under local anesthesia.

Following delivery slight bleeding was continuous; the placenta did not separate in spite of numerous attempts using Credé's method until fifty minutes had elapsed. The uterus failed to contract with oxytocics and was explored manually. Twenty minutes after expression of the placenta the patient was in deep shock. After some time was lost looking for a good vein blood transfusion was begun. However, infiltration occurred. Several attempts were made to enter a vein by cutdown. All were unsuccessful so arterial transfusion was attempted. By this time, however, the patient was in extremis and death occurred before this could be accomplished, three and a half hours after delivery.

Questions. (1) Was the third stage of labor properly managed? (2) Is the use of the Credé maneuver advised for retained placenta? (3) In cases of "failed transfusion" due to collapsed veins, how else may shock be combatted?

Comments. Our management of the third stage of labor has been recently revised, by Dieckmann principally. Much that we have taught must now be forgotten. We have in the

past awaited the classic signs of separation, namely, advancement of the cord, rise of the fundus, change in shape of the uterus and vaginal bleeding. True, these are signs of placental separation, but they are late signs. Waiting for these signs means waiting for the patient to bleed from the placental site. We have long been told, too, that separation was brought about by the development of a retroplacental hematoma whereas the reverse is true. The hematoma is the result of separation, not the cause. Waiting for it will result in unnecessary blood loss.

Management of the third stage should begin in the second stage. The first essential step is slow delivery of the baby through the vaginal outlet. The common practice of expediting delivery by traction and fundal pressure is not physiologically sound. This latter method did not give the uterine muscle time to contract and retract slowly about the placental site and thus cause its complete separation. Dieckmann has recommended that at least three minutes elapse between delivery of the head and the appearance of the lower extremities. One-half to one minute should pass after delivery of the head, another after the anterior shoulder and a third after the posterior shoulder and with the body. There is a natural tendency to hurry unless one uses restraint. Some of this time may be spent in aspirating mucus from the baby's mouth and nostrils. The administration of 1 cc. of ergotrate or 3 minims of pituitrin intravenously with or shortly after delivery of the anterior shoulder promotes uterine contractions and, more important, retraction of the uterine muscle with placental separation.

Immediately following delivery of the baby the obstetrician should concern himself with the management of the third stage. More women die from accidents in the third stage of labor than from complications in the other two stages combined. Further care of the baby is turned over to an assistant. The hand is immediately placed upon the sterile sheet over the abdominal wall to palpate the uterus, yet no attempt is made to deliver the placenta until the uterus is felt to contract firmly and to assume a globular shape; it is then squeezed gently while in a contracted state and drawn upward into the abdominal cavity. Failure of the cord to follow confirms the fact of separation and the placenta is then drawn from the vagina by traction on the cord while the body of the uterus is held with the abdominal hand.

Partial separation of the placenta with its attendant hemorrhage as in this case is extremely rare if the third stage has been managed properly. If it should occur, one should massage the fundus, repeat the oxytocic, attempt gentle expression, and if unsuccessful, perform manual removal promptly. After manual separation of the placenta and before its removal the hand should explore the uterine cavity for a retained cotyledon, succenturiate lobe, myoma, laceration or rupture of the uterus.

The Credé method of expressing the placenta is obsolete. Squeezing of the uterus while exerting downward pressure often results in trauma to the uterine muscle with atony, hemorrhage and even shock. The so-called modified Credé method or the use of the body of the uterus as a piston without squeezing it is not very much better and is also to be condemned. Repeated attempts are bound to become more vigorous with trauma inevitable and the retention of placental fragments with hemorrhage not infrequent. With all our present day safeguards manual removal of the placenta has become much safer.

"Failed transfusion" or the inability to administer available blood to a patient dying of hemorrhagic shock because of technical difficulties is indeed a tragedy. Our files contain many reports of poorly functioning transfusion when blood has been wasted in large quantities with the patient in profound shock, yet lost blood was being replaced in intermittent drops. In these days it is indeed "later than you think." The time element is most important if shock is not to become irreversible. The anoxemia associated with shock may further damage an already atonic uterine muscle. Blood must be replaced rapidly as well as in sufficient quantity.

Postpartum hemorrhage more often than not may be anticipated and preparations made for its treatment. A functioning venoclysis with a needle not smaller than an 18 gauge is often life-saving if started prior to the onset of shock (with its resulting collapsed veins). When peripheral veins are collapsed as in this case, we should always remember that femoral vein transfusion is practical. The technic is not difficult. A No. 17 or No. 18 gauge needle is inserted perpendicular to the skin just distal

to Poupart's ligament, remembering that the vein is medial to the femoral arterial pulsation. In obese women it may easily be found by using a syringe for aspiration. The radial artery may be used as a last resort, the needle being inserted and the flow of blood being toward the heart and not in its usual arterial direction. With present day methods "failed transfusion" seems inexcusable.

CASE II. A patient, aged thirty-one years, gravida II, para I, had a normal antenatal course until late in the seventh month when her uterus was thought to be larger than normal. Two weeks later she was hospitalized because of marked abdominal enlargement with pain and dyspnea. She was in considerable distress. Her abdomen was extremely large and tense. Fetal heart tones were thought to be present. X-ray examination showed a single fetus and polyhydramnios. Uterine contractions began the following day and continued intermittently for twenty-four hours when on vaginal examination the cervix was found to be dilated two fingers. With the patient in a semi-sitting position because of extreme dyspnea the membranes were ruptured and about 8,000 cc. of yellow fluid were allowed to escape. Good labor followed. When the cervix was fully dilated and the head was on the perineum, she was delivered under gas oxygen and ether anesthesia, by low forceps and episiotomy.

The baby when delivered had the typical appearance of the hydrops type of erythroblastosis fetalis. The placenta followed immediately and was very large and friable but seemed to be intact. The uterus contracted normally following the administration of pituitrin and ergotrate and remained contracted during repair of the episiotomy. After the anesthetic was stopped, it was noted that the uterus had relaxed and about 400 to 500 cc. of clots were expressed. Manual exploration of the uterus revealed several small friable remnants of placental tissue which were removed easily. The uterus was well contracted and the patient was returned to bed in good condition. The anesthetic of delivery had lasted thirty minutes.

The patient was observed in bed one-half hour later and found to be in shock. The uterus was relaxed and boggy and about 1,500 cc. of blood and old clots were expelled. Because of continuous profuse bleeding the vagina was packed tightly with gauze. Preparations were made for hysterectomy which was not performed, however, because of her critical condition. The first transfusion was given one hour after the initial hemorrhage. During the next six hours the patient received six transfusions but never recovered from shock. Because of bleeding through the vaginal packing it was removed and a pack was inserted in the uterus as well as the vagina. Bleeding continued, however, and the patient expired six and a half hours after delivery.

Questions. (1) What role did the polyhydramnios play in the hemorrhage? (2) Was general anesthesia advisable? (3) Did the presence of erythroblastosis have any bearing on the hemorrhage? (4) How may delayed postpartum hemorrhage be controlled? (5) Of what value is vaginal and uterine packing in postpartum hemorrhage?

Comments. Polyhydramnios probably played an important role in the postpartum hemorrhage. Like multiple pregnancy or a large fetus it causes overdistention of the uterus. As a result retraction and contraction of the muscle fibers may be poor with a tendency toward bleeding. Postpartum hemorrhage should always be anticipated. At least 1,000 cc. of blood must be available for immediate use and a venoclysis should be functioning. In the management of polyhydramnios it is important to draw off the amniotic fluid slowly and even more important to deliver the baby slowly together with the administration of an intravenous oxytocic. The elongated muscle fibers need time to accommodate themselves to the rapidly emptying uterus. If the uterus is emptied slowly, uterine retraction occurs, i.e., the muscle bundles become superimposed and slide over each other, twisting and bending the venous sinuses and stopping the flow of blood.

It is not within the scope of this paper to argue the question of general anesthesia and its relation to postpartum hemorrhage. Its judicious use in the average normal case may certainly be approved. To use it in a case in which atony and hemorrhage may be anticipated, such as this one, is always poor judgment. Some form of nerve block would be the anesthetic of choice whether it be perineal infiltration, saddle block or low spinal anesthesia. The choice depends upon the extent of the operative procedure.

Erythroblastosis was a factor in the postpartum hemorrhage. The polyhydramnios and large friable placenta characteristic of this con-

dition contributed. The role of the polyhydramnios has been discussed.

Retention of placental fragments is a frequent cause for postpartum hemorrhage. It usually results from improper management of the late second and third stages of labor. Careful examination of the placenta immediately postpartum will usually reveal the characteristic defects on its maternal surface. When suspected the treatment, as in this case, should be immediate exploration of the uterine cavity observing the usual aseptic technic with change of gloves. Retained placental tissue is not uncommon following delivery of the large, thick, edematous and friable placenta so characteristic of erythroblastosis and one should routinely explore the uterus in these cases.

Despite previous errors in technic and judgment, in the last analysis this patient lost her life primarily because she was not properly observed in the immediate postpartum period. She was returned to bed while still under the effect of a general anesthetic. Even though the uterus was firmly contracted, retraction had not occurred; and when the inevitable relaxation occurred, she had profuse hemorrhage unattended and went into shock from which she never recovered. A recovery room with a nurse in constant attention is, of course, the best solution. However, more often than not, restrictions in personnel and available space do not permit this ideal arrangement. If necessary the patient is returned to the labor room where observation will be adequate. If returned to her postpartum bed frequent and accurate observations must be made as to the size and degree of contraction of the uterus and amount of vaginal bleeding. There is no substitute for this if delayed postpartum bleeding is to be avoided.

Remarks on the use of the vaginal and uterine packing will follow the next case report.

Case III. A primipara, aged thirty years, was admitted to the hospital after irregular labor of nearly twenty-four hours. Several uterine myomas could be felt abdominally. The presentation was vertex, unengaged in right occipitoposterior position. When the uterine contractions increased in intensity and recurred every three to five minutes, the patient was given ¼ gr. of morphine and 1/200 gr. of scopolamine. On the next day contractions were noted to be very irregular and rectal examination showed the cervix to be thick and dilated 2 cm., and the vertex was still above the spines. Pitocin, 2 minims every twenty minutes for four doses, gave no response.

The second day labor was still poor but the cervix was found to be dilated 4 cm. Pitocin was repeated with no response. Later that day, with labor still poor, the membranes ruptured and the vertex was found at the spines in the right occipitotransverse position. The fetal heart remained normal and the patient's general condition appeared good.

On the fourth day considerable meconium was observed and the fetal heart rate varied from 160 to 180. Labor was still poor. The patient's temperature, pulse and respiration were normal, but she looked tired. Delivery was accomplished under pudendal block anesthesia, by Dührssen's incisions, manual rotation and low forceps from the left occipitoanterior position. Plasma, 500 cc., was then given and the angles of the cervical incisions sutured while extrusion of the placenta was awaited. The uterus although contracted had a doughy, breast-like consistency, with palpable subserous fibroids. Because of continuous but moderate bleeding from the uterine cavity for a period of two hours following delivery the placenta was manually removed. At that time a large intramural fibroid about 5 cm. in diameter could be palpated in the fundal area. Pituitrin, 2 cc., was injected directly into the uterine wall and ergostrate, 2 cc., was given intravenously. Because of bleeding the uterus was packed with gauze and the cervical incisions and episiotomy repaired. The pulse at this time was 160 and of poor quality. The patient was then typed for transfusion and 750 cc. of blood were given. There was, however, slow, continuous bleeding from the vulva. The uterus, although packed with 10 yards of gauze 3 inches wide, was soft and dilating with evident bleeding behind the packing. The packing was removed, clots were expressed and pituitrin again given directly into the uterine wall; the uterus was then repacked. The patient's condition became steadily worse; the pulse was soft and thready and at times imperceptible. Shock was profound in spite of so-called shock treatment, namely, morphia, plasma, blood, glucose and saline, adrenal cortical extract intravenously and exaggerated Trendelenberg position. The patient did not rally and expired about three hours after delivery.

Questions. (1) Should not this patient with multiple fibroids and poor labor have had a

cesarean section shortly after admission? (2) Is primary inertia conducive to postpartum atony and hemorrhage? (3) What role did the fibroids play? (4) When should manual removal of the placenta be performed? (5) Of what value is vaginal and intrauterine packing in the control of hemorrhage? (6) Will the use of oxytocics during delivery cause incarceration of the placenta?

Comments. As one would expect, a uterus which contracts poorly in the first two stages of labor is not likely to contract and retract well in the third stage of labor. The dehydration, acidosis, exhaustion and difficult forceps deliveries so often associated with uterine atony and prolonged labor increase the degree of atony and hence the risk of hemorrhage. If malpresentation of the fetus, cephalopelvic dysproportion and overdistention of the uterus can be ruled out as causes, it is probable that atony is due to a disturbed neuromuscular mechanism. It is in this type of case that the judicious use of very small dilute doses of pituitrin by the intravenous route has proved so beneficial. The indiscriminate and improper use of this oxytocic in the past should not prejudice us to the point where we are not willing to learn its proper use. The patient must be under constant observation while receiving the drug, and the virtue of its administration by the drip intravenous route lies in the ease with which the dose may be controlled or discontinued.

Uterine inertia is not uncommon in the presence of fibromyomas, especially when they are multiple. Postpartum hemorrhage may occur because the distorted myometrium has difficulty in compressing the vessels of the placental site. Anomalies in separation of the placenta are apt to occur, especially when submucous tumors are present, as in this case. The treatment of persistent postpartum bleeding due to fibromyomas is hysterectomy and not uterine packing.

The indications for manual removal of the placenta have been broadened considerably in the past few years. It is difficult to specify certain time limits within which the placenta should be removed manually. If a patient loses 250 to 300 cc. of blood and the placenta cannot be delivered by gentle massage and squeezing of the contracted uterus, it should be removed promptly regardless of time limits. When the second and third stages of labor have been managed properly by slow delivery of the baby and the use of oxytocics, manual removal will seldom become necessary. In the absence of bleeding the placenta may be removed by the experienced operator after ten minutes; the inexperienced should not wait longer than one hour.

Incarceration of the already separated placenta by the uterus is mentioned in most textbooks. There is some doubt if such a condition ever occurs; at least there have been no cases in the experience of the authors. Certainly fear of its occurrence would be no argument against the use of oxytocics prior to delivery. A separated placenta will occasionally lie free in the lower uterine segment and the vagina, being held there by its membranous attachments. Its delivery is easily accomplished by hand.

Manual removal of the placenta is as important a part of the obstetric intern's training as the application of low forceps and the repair of an episiotomy. Only by removing the placenta under supervision in normal cases will he be properly trained to remove it when hemorrhage makes removal imperative. The occasional perforation of the uterus, retained cotyledon, infection and other accidents which follow efforts at manual removal by the inexperienced and excited operator will not occur.

The use of uterine and vaginal packs in the control of postpartum hemorrhage is now a controversial subject. Whether there still is a place in modern obstetrics for this form of therapy seems very doubtful. However, textbooks advocate and still describe in detail the technic. The fact that patients have survived this form of treatment may not justify its continued use. Our files contain numerous cases of death from hemorrhage in which the uterine pack was used ineffectually. Advocates of the pack would have us believe that it was not properly placed, yet many of these women were attended by obstetricians in our better hospitals. The temporary mental relief afforded the obstetrician by a pack is often purchased only at the expense of additional blood loss. Often the packing not only fails to stop the bleeding but contributes to death by lending a false sense of security as a result of the temporary cessation of blood flow. This is amply illustrated by this case as well as the one to follow. The filling of a resilient and elastic organ such as the uterus with a pack presents definite mechanical difficulties. The manipulations as-

sociated with packing may stimulate temporary contraction of the uterus only to be followed with subsequent relaxation and hidden bleeding. Control of postpartum hemorrhage depends upon retraction of uterine muscle fibers. A pack may hinder rather than aid that process.

It has been shown that ten yards of 3-inch intrauterine gauze packing when tightly packed will absorb 1,000 cc. of blood. Much valuable time and even more valuable blood is lost and shock becomes profound with the result that other and better methods of therapy can no longer be used. Intrauterine packing is more often than not a desperation procedure, poorly done under adverse circumstances. The use of the intrauterine pack should be restricted to those cases of persistent postpartum bleeding in which facilities for laparotomy are not immediately available. However, once the operating room has been prepared the packing should be removed and laparotomy performed if bleeding continues.

Case IV. A twenty-seven year old multipara, twenty-five weeks' pregnant, was brought to the hospital by an ambulance because of bleeding of three hours' duration. She was bleeding freely on admission and the uterus was thought to be "spastic." She was given 1/6 gr. of morphine on admission since she had received 1/4 gr. of morphine at home. About fourteen hours later she was given 1,000 cc. of 10 per cent glucose and the vagina was packed. The next morning, eight hours later, the patient was in shock and bleeding through the pack. The head of the bed was lowered and she was given intravenous glucose and cardiac stimulants. Four hours later a consultant found the uterus hard and the cervix dilated two fingers; no fetal heart was heard. A diagnosis of abruptio placentae was made.

In the delivery room the consultant removed the packing, gave the patient two doses of pituitary extract, each 4 minims, and delivered a stillborn fetus by breech extraction. The placenta was expressed immediately and large clots and profuse bleeding followed. Blood, 1,000 cc., was then trausfused. Pituitary extract and ergonovine were given, followed with coramine and strychnine. The vagina was packed but bleeding continued. This pack was removed and the uterus and the vagina tightly repacked, but bleeding continued through the packing.

The patient was taken to the operating room and supravaginal hysterectomy was performed under local anesthesia. Her color was poor and her pulse rate 150 at this time. The operating time was thirty minutes. Shock became more profound and death occurred about two hours after operation. The pathologic report on the removed uterus was widespread myometrial hemorrhage (Couvelaire uterus).

Questions. (1) Did this patient receive the correct treatment for separation of the placenta? Did she receive good treatment for shock? (2) How may a Couvelaire uterus be diagnosed? (3) What place does hysterectomy have in the treatment of postpartum hemorrhage?

Comments. Even with a Couvelaire uterus (one infiltrated with blood) contraction and retraction of the muscle fibers may be good. After removal of the placenta if the corpus remains flabby and bleeding continues in spite of pituitary extract and ergonovine, one should not hesitate to ligate the uterine arteries and if necessary amputate the uterus.

Some form of active therapy should be instituted once a diagnosis of abruptio placentae has been made. Opinions differ as to the relative value of cesarean section and more conservative therapy, but active intervention is always indicated. Rupture of the membranes with small doses of pituitrin will suffice in the great majority of cases. Cross matched blood in sufficient amounts should always be immediately available. If bleeding becomes excessive or labor does not progress satisfactorily, cesarean section is indicated.

When is hysterectomy indicated for postpartum hemorrhage? The decision will obviously be a difficult one to make, but make it we must. There is a natural reluctance to subject an already anemic and frequently traumatized patient to a major surgical procedure involving the sacrifice of her uterus. Good judgment is necessary and the decision must be earlier than in this case. In postpartum hemorrhage as in placenta previa the initial hemorrhage is rarely fatal. It is the repeated bleedings which eventually result in death. Management of these cases should be as follows: (1) Once the bleeding reaches hemorrhagic proportions the uterus should be explored manually. The cervix and lower segment are carefully examined for lacerations or rupture. Clots, fragments of pla-

centa or membranes are removed. (2) Combined internal and external uterine massage is performed, following which the hand is slowly removed. (3) Oxytocics are repeated, 3 minims of pituitary extract and 1 cc. of ergonovine being given intravenously. (4) The uterus is then controlled through the abdominal wall by means of the Dickinson maneuver. The lower segment is held tightly between the thumb and fingers of the right hand compressing the uterine vessels and at the same time pressing the uterus upward and backward against the promontory and lumbar spine. With the left hand the corpus is gently massaged and squeezed using rotary movements of the fingers. (5) Blood should be administered. (6) If bleeding continues, preparations are made for hysterectomy. (7) After the abdomen has been opened, ligation of the uterine arteries as recommended by E. G. Waters should be attempted before hysterectomy. Using a large needle a block suture ligature is placed around the uterine arteries at the upper level of the peritoneal bladder reflection. Following this simple procedure bleeding usually stops, uterine ischemia causes prompt contraction, yet collateral circulation is sufficient to prevent tissue necrosis. If unsuccessful little time has been lost and hysterectomy may still be done.

SUMMARY

The management of postpartum hemorrhage may be divided into three phases, namely, the anticipatory or preparatory phase, the preventive phase and the bleeding phase.

Adequate anticipatory treatment means a functioning venoclysis with available cross matched blood in all cases of cesarean section, ablation of the placenta, placenta previa, breech extraction, multiple pregnancy, polyhydramnios, prolonged labor or difficult forceps delivery.

Preventive treatment may be summarized as follows: avoidance of general anesthesia in any case in which hemorrhage may be anticipated; slow delivery of the baby and the use of intravenous oxytocics; earlier manual removal of the placenta; and avoidance of Credé expression of the placenta.

Management of the bleeding phase consists of the following: adequate and prompt blood replacement; manual exploration of the uterus; intravenous oxytocics and uterine massage; avoidance of vaginal and uterine packs; and ligation of uterine arteries or hysterectomy.

Case Reports

A CAROTID BODY TUMOR

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A YOUNG man twenty-nine years of age was referred to us with a fairly large tumor on the left side of his neck which eventually proved to be a carotid body tumor. Because this is such a rare condition, there being less than 300 cases in medical literature, we believe that it merits a report.

Normally, the carotid body is a small organ about 8 mm. in diameter situated near the bifurcation of the common carotid artery.

Authorities differ as to its function. Some students believe it should be in the chromaffin system; others state that there is some physical connection with the carotid sinus and the sympathetic nervous system. Paraganglions are the most common tumors of the sympathetic nervous system.

Lewis states that tumors of the carotid body are the most representative of the paraganglion group.

Boyd with all his pathologic experience states that he has seen only one carotid body tumor and gives the average surgical mortality at 30 per cent.

He also states that, "Pathological study reveals a connective tissue capsule which divides the tumor into lobules. These cells have a pale epithelial appearance with somewhat granular protoplasm. The nuclei are eccentric and contain granules having an affinity for chrome salts, which may make them stain brown."

It has often been noted that pressure on the carotid artery in the human subject may cause slowing of the heart. It has been taught that this was due to pressure on the vagus.

Best and Taylor quote experiments to show that there is considerable doubt that the vagus nerve has any real function in this physiologic act but it is far more likely to be due to the carotid sinus. It has been shown in surgical procedures that even pressure on the vagus nerve by forceps shows it to be unresponsive to mechanical stimulation.

We do not doubt that this sinus has some effect on lowering the heart rate and blood pressure but in our opinion any clinical signs would be from bilateral severing of this sinus.

During this surgical procedure we ask the anesthetist several times, even after severing the carotid artery, if there was any change in pulse rate or respiration and he observed none.

As a rule the benign character of this lesion can be determined by the length of the clinical course.

Some of the points of diagnostic importance in this clinical condition are the following, namely, (1) location of this tumor at the bifurcation of the carotid artery, (2) long duration of symptoms and slow growth, (3) expansible pulsation bruit and thrill from its contained artery, this often confuses the diagnosis with aneurysm, (4) tendency of the growth to bulge into the pharynx without causing ulceration of the mucous membrane and (5) failure to respond to radiation treatments.

The treatment advised in this rare condition has been total surgical excision. Regardless of this advice many surgeons hesitate to do so because it has been stated there was an average mortality of 30 per

cent and some report it as high as 50 per cent when the common carotid had to be ligated.

No less an authority than Leahy went so far as to advise that, "If the carotid body surrounds the internal, external and common carotid arteries, removal by ligation of the common carotid and internal and external carotids should be done only when biopsy demonstrates the tumor to be truly of a malignant character."

Our studies would lead us to disagree with this opinion. First, because if you leave a tumor of this type in position, you have accomplished nothing and it may already be somewhat anaplastic, as in this case, and thus you could be preventing something worse. Second, unfortunately, although many may not agree, the longer I am engaged in surgery and the more real malignancies I see the more pessimistic I become in regard to cancer cure.

Others who report a high mortality (30 per cent) for ligation of the common carotid artery due to cerebral anemia, etc., must have overlooked some other causes of death in their reports. A careful study of the anatomy of this artery and its branches will show that a collateral circulation can be prefectly established (1) by the free communication which exists between the carotid artery on both sides, both without and within the skull; (2) by the enlargement of the branches of the subclavian artery on the same side on which the carotid has been ligated and (3) the chief communications outside the skull occur between the superior thyroid from the external carotid and the inferior thyroid from the subclavian and the superior intercostal with the arteria princeps cervics of the occipital. The vertebral artery takes the place of the internal carotid within the cranium. Probably, the former attempt at surgery in this case elsewhere could have helped establish a collateral circulation.

CASE REPORT

A young man was referred to me by a neurophysiatric physician in April, 1949, whose chief complaint was a large lump on the left side of his neck which he stated began about January, 1944, and had gradually increased to its present size. He had been seen by Navy physicians inasmuch as he was on duty with the Marine Corps for eighteen months. No one had advised a surgical procedure. He had been seen by various physicians since discharge and was finally explored elsewhere on November 13, 1947. The report of the procedure at this hospital was very indefinite but evidently the surgeon, although he did not make a definite diagnosis, decided that discretion was the better part of valor and left the tumor *in situ*.

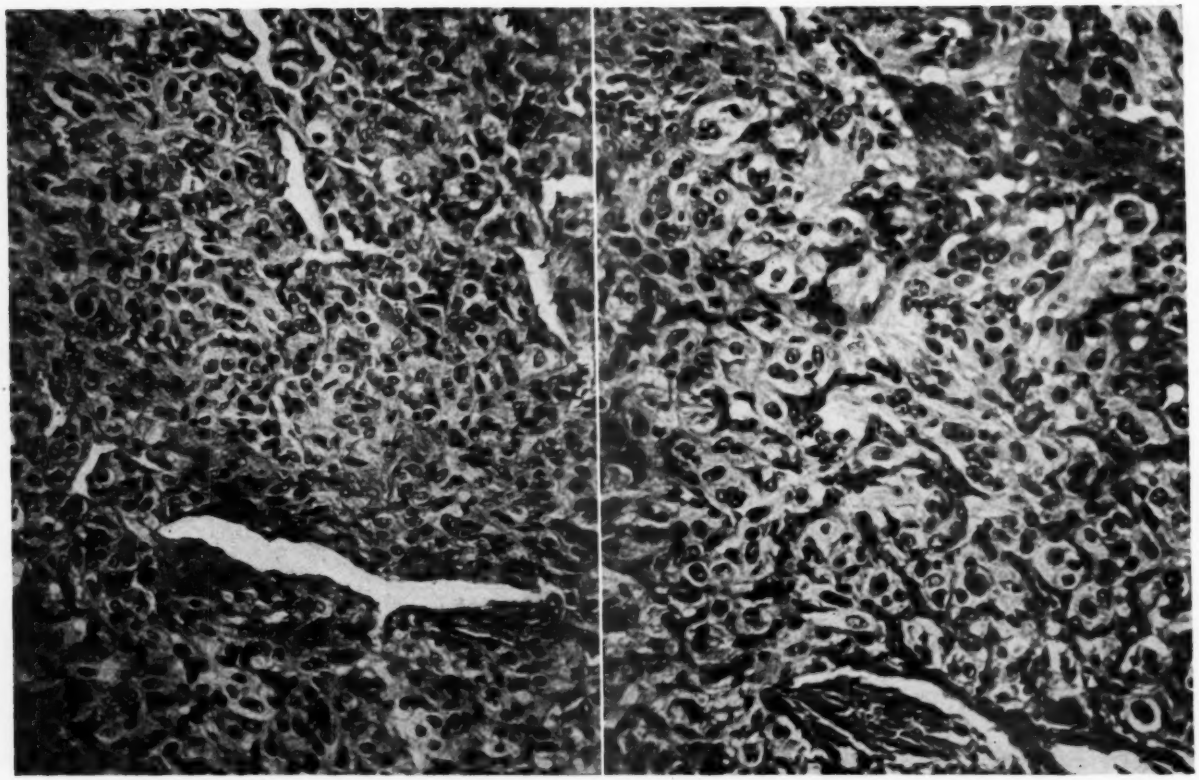
When the young man saw us, he was faced with a dilemma in that he could not secure a job. He had completed his G. I. education, was married and had a family. With the exception of an occasional headache and some difficulty in talking due to the pressure of the deep mass in his neck he was in good physical condition. At all places of employment the personnel manager or examining physician refused to consider him for employment because of the lump on his neck.

On physical examination his general condition was found to be negative except for a pulsating lump on the left side of his neck across which there was a scar about 3 inches in length from a former attempt at surgery. Numbers two, three and four of our diagnostic criteria were fulfilled but, frankly, before surgical exploration our diagnosis was somewhat indefinite.

Since, it was established that if the young man was to have an opportunity for a livelihood, he would have to have this tumor removed. Therefore, he was admitted to the Akron City Hospital for preparation and surgery.

On April 26, 1949, the following surgical procedure was carried out under general anesthesia.

Our findings revealed there was an old scar 3 inches in length and 1 inch below the ramus of the left mandible from a former surgical procedure. A great deal of scar tissue was present over the subcutaneous tissue, the platysma and triangle muscle, which made the identification of these structures somewhat difficult. It appeared at first that there might be an anterior arteriovenous aneurysm but this later proved to be an enlargement of the external jugular vein fixed in scar tissue. In the deeper structures of the neck there was a



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FIGS. 1 and 2. Two views of the pathologic section of the tumor.

rather large tumor about 2 by 4 inches which began at the bifurcation of the common carotid artery with the artery passing directly through it. The artery appeared to be about ⅜ inch in diameter but was somewhat contracted by the tumor mass. The upper end of the tumor extended well upward beneath the left ramus of the mandible. There were several nerve structures surrounding the mass probably cervical branches of the facial nerve.

The procedure was as follows, namely, an incision was made over the old scar which was later extended downward. The scar tissue of the platysma and the triangular muscles of the neck were opened anterior to the sternomastoid muscle. A pulsating tumor was then palpated and gave us the impression that we were dealing with an aneurysm. The incision was extended downward from the mass so that we might find the trunks of the carotid and work from below the tumor. The external jugular vein was clamped, doubly ligated and cut and dissected up to what appeared to be an aneurysm. This proved to be a large dilation of the external jugular vein which when dissected off with its accompanying scar tissue exposed a tumor mass beneath. At this time a definite diagnosis of carotid tumor could be determined. The mass could then be separated from surrounding structures fairly easily by blunt dissection. The vagus nerve was retracted posteriorly. The carotid artery below its accompanying tumor was doubly clamped and cut. The tumor with its accompanying arteries was freed to well above the upper portion of the mass and it was again doubly clamped and the tumor removed entirely. Each end of the artery was doubly ligated with mattress sutures of chronic catgut. The patient appeared in good condition. One small rubber drain was inserted at the base of the removed tumor and the incision was closed with interrupted catgut in the muscle and interrupted dermal sutures in the skin and subcutaneous tissue. There was no pulsation in the left superior temporal artery at the conclusion of the operation or at the time of discharge. This contrast with the right was very marked.

The microscopic report showed fairly well encapsulated cellular neoplasm with many large hyperchromatic nuclei, the cells having vacuolated or eosinophilic cytoplasm. The trabeculas, vascular channels and at least partial alveolar arrangement of neoplastic cells are

entirely consistent with the usual carotid body tumor. The neoplasm differs in greater cellularity and more hyperchromatism. It occurs in intimate association with a large artery of elastic type compatible with common carotid or one of its branches. Carotid body tumors in general may recur or, less commonly, metastasize regionally but usually do not give rise to more widespread metastasis. In my opinion, this is a rather anaplastic type of carotid body tumor. (Figs. 1 and 2.)

The patient made an excellent recovery both immediate and while in the hospital. The only complication was a slight loss of feeling over a small portion of the left ramus which was no doubt due to an injury of one of the sensory nerves during deep dissection and a slight temporary loss of full voice due to temporary loss of function of a branch of the recurrent laryngeal due to surgical trauma. At the time of our last examination both of these findings had disappeared. The good feeling of the patient both physical and mental was quite marked.

CONCLUSION

1. A case of successful removal of a large carotid body tumor which had been unsuccessfully attempted elsewhere is reported.

2. A brief discussion of the history diagnosis and successful treatment of this rare pathologic lesion is given.

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VON WILLEBRAND'S DISEASE IN PREGNANCY*

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HEREDITARY hemorrhagic diathesis is so rare in the pregnant and peurperal patient that this unusual case was thought worthy of reporting.

Glanzman has described a group of cases with familial transmission to both sexes without thrombocytopenia and characterized by a prolonged bleeding time and a poorly retractile clot. Bleeding from cuts, wounds, epistaxis and menorrhagia occurred.

Von Willebrand described a case of pseudohemophilia in which the disease was transmitted as a dominant sex-linked characteristic. Unlike hemophilia, either the affected mother or father could transmit the disease to the children of either sex.

CASE REPORT

Mrs. M. T., gravida 1, Para 0, a twenty-one year old white woman, was seen by one of us (C. H.) on July 20, 1947. At this time her past history and general physical examination were negative. Her last menstrual period was on May 18, 1947. Pelvic examination revealed a normal gravid uterus of two months. The pelvic measurements were ample.

On September 2nd the patient developed severe bronchitis and was admitted to Sibley Memorial Hospital. At this time the basal metabolism was plus 4 per cent, sputum examination was negative and blood examination revealed hemoglobin 62 per cent, red blood cells 3.45 million and white blood cells 12,600. The red cell fragility test was normal. The patient responded well to penicillin and crude liver and iron therapy and was discharged on September 8th.

The patient was readmitted March 6, 1948, at term, having experienced no other difficulty during pregnancy. Following a labor of twelve and a half hours she was delivered of a healthy male child by low prophylactic forceps. A right mediolateral episiotomy was done and repaired with interrupted chromic catgut. The delivery was uneventful; the placenta was complete. The patient was returned to her room and continued to pass clots. Her hemogram on admission was hemoglobin 75 per cent, red blood cells 2.91 million, white blood cells 14,400 and polymorphonuclears 85 per cent.

She continued to pass clots and on her fifth postpartum day went into shock with a hemoglobin rate of 35 per cent and a red blood count of 1.97 million. She was treated with plasma and blood. Because of persistent oozing she was taken to the operating room. Here dilation and curettage were performed and a right vaginal hematoma, resulting from the episiotomy, was incised and drained. The patient did well.

Pathologic report revealed only decidual tissue and no placental remnants. Blood studies on the day of operation revealed normal prothrombin, bleeding and coagulation times. The platelet count was 812,600, hemoglobin 65 per cent and red blood cells 3.40 million. The patient was discharged on the fourteenth postpartum day.

She returned for her postpartum visit on May 15th. Her condition was satisfactory except for a small erosion of the cervix. This area was coagulated with electrocautery. Ten days later bleeding began which continued. On June 25th she was recauterized and the bleeding stopped. On July 7th she again began to bleed profusely and on July 9th was readmitted to the hospital.

A systemic review was still negative at this time. Physical examination was negative except for the cervix which looked like one large dark clot and was oozing moderately. The question of carcinoma of the cervix or simple erosion was considered.

A hemogram on admission showed hemoglobia 50 per cent, red blood cells 2.90 million, white blood cells 12,100 and polymorphonuclears 81 per cent. A vaginal pack was inserted and the

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patient transfused. Four days after admission the patient was taken to the operating room where dilation and curettage were performed as well as a biopsy of the anterior cervical lip. Frozen section and stained slides revealed gelfoam® (inserted by the family physician) and endocervicitis.

On the first postoperative day the bleeding resumed. The vagina was sprayed with thrombin and oxycel® placed against it. The second day the patient went into shock and the vagina was packed. Hemoglobin was 43 per cent, red blood cells 2.25 million, white blood cells 3,800 and the platelet count 173,000 per cu. mm.

The temperature remained normal throughout the entire course. The patient had difficulty voiding because of all the vaginal manipulations. Medical therapy consisted of ergotrate,® Vitamin K, testosterone,® calcium gluconate and jeculin.® After several transfusions the patient was discharged on July 21st.

On July 29th she again began to bleed. She was seen the next day by one of us (M. S. K.). At this time she was bleeding from a small granulating area at 12 o'clock on the cervix that was apparently the site of the biopsy. This area was cauterized. She was seen several days later, at which time the bleeding had stopped and the area appeared to be healing. On August 19th the bleeding recurred and the area was touched with silver nitrate. On August 10th the bleeding became profuse and the patient was readmitted to the hospital.

Her chief complaint was bleeding, as usual. Her systemic review still was negative. Physical examination was essentially negative and revealed a blood pressure of 115/70.

The patient was taken to the operating room on August 11th. On vaginal examination the original site of the biopsy was seen to be bleeding. A V-shaped section was removed to freshen the edges. This was closed with chromic catgut and the patient was packed with gauze. On section, however, only granulation tissue was found.

Four days later the vagina was again packed with gelfoam® and gauze. Oozing continued and on August 16th the patient again went into shock. She was transfused with 500 cc. of blood and taken to the operating room. On examination the cervix was quite edematous and the anterior lip showed a large sloughing area. Cotton sutures were placed through-and-through. The bleeding was checked and penicillin suppositories placed in the vagina. The patient received 1,000 cc. of blood after the following laboratory work was completed: coagulation time normal; bleeding time definitely prolonged; platelet count, 195,000 per cu. mm.; hemoglobin, 40 per cent; red blood cells, 2.17 million.

Finally, on the twentieth, four days after the previous procedure, the patient was taken to the operating room again because of bleeding. The cervix was examined. It was believed that nothing could be done locally except an amputation of the cervix, which was thought unwise at the time. Hence a total hysterectomy was done. Both tubes and ovaries were left because of the patient's age. At the conclusion the abdomen was quite dry. She received transfusion again and thromboplastin was started intramuscularly.

On August 21st the blood count revealed a hemoglobin rate of 56 per cent and a red blood count of 3.25 million. The patient continued to have some vaginal bleeding. On the second postoperative day the entire abdominal incision began to bleed. This was stopped with thrombin topical® and no further difficulty was experienced.

At this point the family suddenly remembered that there had been a bleeding tendency in the family and the following information was obtained: The patient's mother had had a tendency to bleed since childhood. She bled for seven days after her tonsils were removed; she also bled when her teeth were removed, hence, could have only two removed at a time. She required a "shot of serum" to stop the bleeding; the type of serum was unknown. She had had no major operations. She had two children and after the second she hemorrhaged twice. No blood studies had been done but her clotting time was prolonged. She was forty-three years of age. The patient's brother was nine years old. He bled from a dorsal slit as a child and the doctor was afraid to circumcise him. He bled for seven days following a tonsillectomy, but no studies were done. The maternal grandmother had been operated upon three times without difficulty. The maternal grandfather had some tendency to bleed following tooth extractions. A daughter of the grandfather's sister died of hemorrhage at this hospital four years previously following a miscarriage. The father and father's family had no apparent difficulty.

On August 24th, 1948, the following studies were completed: platelet count, 175,000 per cu.

mm.; hemoglobin, 55 per cent; prothrombin and coagulation times normal; bleeding time prolonged. The patient received another transfusion. At this point she had a mild urinary infection and some abdominal distention. No real evidence of intra-abdominal bleeding could be found.

The patient became ambulatory on August 26th, six days postoperatively. The following day she again began to bleed vaginally. On the twenty-eighth the vagina was packed with gelfoam® and gauze and the patient was transfused. A bone marrow puncture was done at this time.

Daily transfusions were given until August 31st when a report of the marrow puncture was returned with the following statement: "This bone marrow study shows no evidence of any leukemia or primary disease due to platelet deficiency. In view of the finding of a prolonged bleeding time with a normal coagulation time and normal clot retraction, this would appear to be a case of so-called pseudo-hemophilia which is classified under the title of von Willebrand's hemorrhagic disease which is a familial disease found in females and transmitted from generation to generation. The disease is characterized by an inability of the platelets to break down and initiate clot production. Therapy should be directed to maintaining a normal red cell count. This may be facilitated by using freshly-drawn blood which contains an increased quantity of clot-producing factors."

This recommendation was followed and the patient received several transfusions. On September 1st her hemoglobin was 75 per cent and the red blood count was 4.05 million.

On August 8th the patient again was ambulatory. Three days later she was discharged from the hospital in apparently good condition.

She spent a total of sixty-six days in the hospital and received twenty-two transfusions and approximately 6 pints of plasma.

Omitting the detailed gross and microscopic descriptions following the total hysterectomy, the following pathologic report was made: "Perineal tissue showing chronic plastic changes; subacute endocervicitis with ulceration and hemorrhage; hyperplastic endometrium, Swiss cheese type; chronic myometritis.

When the patient was seen recently, there was no further bleeding. She was gaining weight and looked quite well. The vaginal vault showed some granulation tissue often seen following total hysterectomies.

SUMMARY

A case is reported of pseudohemophilia in a twenty-one year old white primipara.

PRIMARY CARCINOMA OF THE JEJUNUM

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PRIMARY carcinoma of the small intestine is a rarity. Approximately 400 cases have been reported to date. Even though the literature during the past decade is replete, the addition of another case with some discussion of the incidence, pathology and diagnosis seems appropriate.

There is a difference of opinion among authors as to which segment of the small bowel is most commonly affected by carcinomatous growths. Nothnagel[1] reported the occurrence of nine carcinomas of the jejunum in 3,585 deaths from carcinoma. Later the same author[2] reported 243 instances of intestinal sarcoma in 24,358 autopsies. Six of these cases were in the ileum; none was in the jejunum. Swan[3] found sixty-six cases of jejunal carcinoma in a series of 182 cases of malignant tumors of the small intestine reported in the literature from 1929 to 1945. Christopherson and Jacobs[4] from 90,892 autopsy records observed carcinoma of the small intestine in fifty-eight, of which twenty-six were situated in the duodenum, eight in the jejunum, twenty-two in the ileum and two undetermined. Bell[5] states that carcinoma of the jejuno-ileum forms about 3 per cent of all intestinal carcinomas. Ficarra and Marshall[6] found only twelve cases of carcinoma of the jejunum over a thirty-year period at the Leahy Clinic. Medinger[7] reported twelve cases of carcinoma of the jejunum of 1,456 autopsies and 41,000 surgical specimens. Boman[8] discovered three cases in 230,000 admissions to two hospitals in Duluth, Minnesota. Mayo[9] reported only forty cases over a period of forty years. Rankin and Mayo[10] reported 101 cases of small intestinal malignancy with twenty-four occurring in the duodenum, thirty-nine in the jejunum, thirty in the ileum and thirty in multiple sites. Mayo and Nettrour[11] reported that in the period from 1921 to 1930 twenty-five cases of carcinoma of the small intestine were encountered, of which eight were situated in the jejunum. In this period 0.47 per cent of all gastrointestinal carcinomas involved the small intestine and 0.15 per cent of the total number of carcinomas of the gastrointestinal tract were located in the jejunum during this ten-year period. Weinberger and Paltauf[12] reported that in a series of 1,410 neoplasms taken from the gastrointestinal tract from the esophagus, caudal, twenty primary carcinomas were encountered in the small bowel. Two were located in the duodenum, five in the jejunum and one in the ileum. Maingot[13] of England in his experience to date has operated upon only four carcinomas of the small intestine, of which three were situated in the jejunum and one in the ileum. At St. Andrew's Hospital, Minneapolis, during the period from 1940 to 1949 there were 30,596 hospital admissions, with 4,398 surgical and autopsy specimens. A total of 644 cases of malignancies were found of which 286 lay in the gastrointestinal tract from and including the stomach, caudal. One carcinoid tumor of the terminal ileum, one malignant melanoma of Meckel's diverticulum and one primary carcinoma of the ileum were encountered in addition to this case.

The gross pathology of carcinoma of the jejunum is usually of the annular, napkin-ring type. There is dilatation of the bowel above and collapse below. The extent of each is dependent upon the age of the lesion. The sessile and polypoid varieties are more infrequently found. Intussusception is often associated with the last two lesions.

Wangensteen[14] states that "the correct diagnosis of carcinoma of the small intestine may be made on the presence of symptoms of intestinal stenosis, due to narrowing of the lumen and stricture formation."

FIG. 1. Roentgenogram showing obstruction of jejunum by an annular lesion and dilatation of proximal loop.

There are several interesting observations to be considered which may assist one in making at least a provisional diagnosis of carcinoma of the jejunum: (1) Carcinoma of the jejunum most commonly found is the annular, obstructing type. The complaints are, therefore, those resulting from slow but nevertheless progressive obstruction and occlusion of the lumen of a portion of gut occupying a high level in the intestinal canal. (2) Stricture in most instances occurs long before the effects of regional or remote metastases have manifested themselves. (3) Symptoms invariably are chronic in nature. (4) Mayo and Nettrour observed that the signs and symptoms from this lesion resemble those of neoplasms in the right colon, with associated progressive weakness and weight loss, bouts of indefinite abdominal distress, anemia, microcytic and hypochromic in character, and positive traces of occult blood in the stool. (5) The possibility of the existence of this disease should be constantly kept in mind during the process of radiologic gastrointestinal studies in a patient with any persistent, unexplainable abdominal complaint. Routine fluoroscopy and serial films may not be sufficient to make the diagnosis unless the degree of obstruction is far advanced. (6) Pertinent abdominal physical findings are usually absent. The distended loop of gut or the obstructing mass is rarely palpable. (7) Physical and laboratory findings are those concomitant with slow starvation and dehydration.

CASE REPORT

This patient, a white male sixty-seven years of age, was admitted to the hospital December 25, 1948. He stated that his symptoms of epigastric distress and malaise began four months previously. They had progressively increased in severity. Two weeks before his hospital admission he began to vomit everything he ate. Pain at first was not unbearable but it had become increasingly severe, especially after eating. It was always in the mid-abdomen just below the umbilicus. Since persistent vomiting began there had been marked diminution in strength. He stated that he had lost at least 50 pounds in weight since the beginning of his illness. He was examined by his physician in September, 1948, at which time roentgenologic study of his gastrointestinal tract revealed small bowel obstruction. Surgery was advised but was refused by the patient.

Upon admission to the hospital physical examination revealed a markedly dehydrated and undernourished, fairly well developed, white male apparently acutely and chronically ill. General physical examination showed positive evidence of recent loss of weight and strength and perceptible upper abdominal distention but no visible peristalsis. There was some upper abdominal tenderness on deep palpation but no definite mass could be felt. The blood hemoglobin was 88 per cent (13.6 gm.) and leukocytes were 15,500, with neutrophiles 94 per cent. Plasma proteins and chlorides were reduced; the blood urea nitrogen and creatine were elevated. Cephalin-cholesterol flocculation test was 4 plus positive. The serum bilirubin was essentially normal; a stool revealed a faint trace of occult blood. Electrocardiographic tracings revealed positive evidence of coronary insufficiency. A flat plate of the chest was negative.

Wangensteen nasal suction was instituted, followed shortly thereafter by passage of a Wild[15] tube to promote decompression of the proximal segment. Roentgenologic examination of the bowel was delayed forty-eight hours because of the patient's condition. A small, thin barium meal was given. Fluoroscopic examination and spot films revealed an annular obstructing lesion in the jejunum with enormous dilatation of the proximal loops of the jejunum and the duodenum. (Fig. 1.) Parenteral protein with glucose, whole blood and antibiotics were amply supplied. Five days after hospital admission operation was performed.

The preoperative or provisional diagnosis was obstructing lesion in the jejunum, probably carcinoma. On opening the abdomen through a right mid-rectus incision about 600 to 800 cc. of serosanguineous fluid were encountered and aspirated. Several loops of ileum were markedly reddened and distended. The liver was small and contained no palpable nor visible masses. The stomach, duodenum, gallbladder, colon and pelvis revealed no gross pathology. A tumor about 22 inches from the ligament of Treitz was easily identified. It completely obstructed the lumen. The bowel just proximal to the mass measured about 13 cm. in diameter. It was collapsed and contained a minimal amount of intestinal content. The inflated head of the Wild tube was within it about 4 inches from the site of the obstruction. The bowel wall was almost 1 cm. in thickness and markedly injected. The distal gut was shrunken and its walls atrophied. The mesentery adjacent to the obstructed segment was greatly thickened and reddened, and numerous petechiae were noted. The veins appeared to be thrombosed. Two enlarged mesenteric nodes were palpable adjoining the lesion. At operation a diagnosis was made of small bowel obstruction due to annular carcinoma of the jejunum and early infarction of an 8 cm. segment of jejunum immediately proximal to the tumor. Ample wide excision of the mass, infarcted bowel and adjacent mesentery with side-to-side entero-anastomosis was carried out.

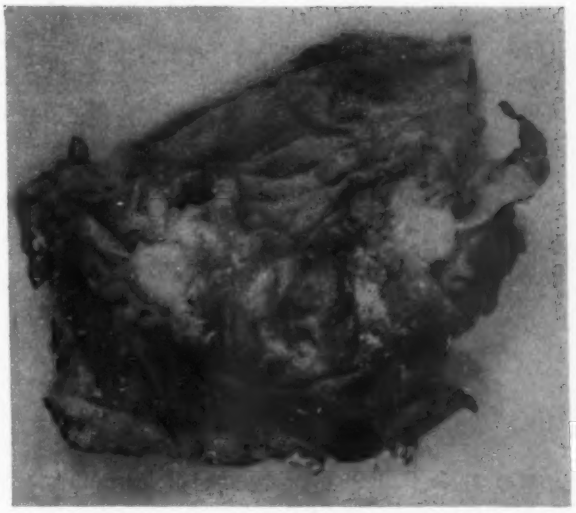

FIG. 2. Photograph of annular carcinoma of jejunum; surgical specimen.

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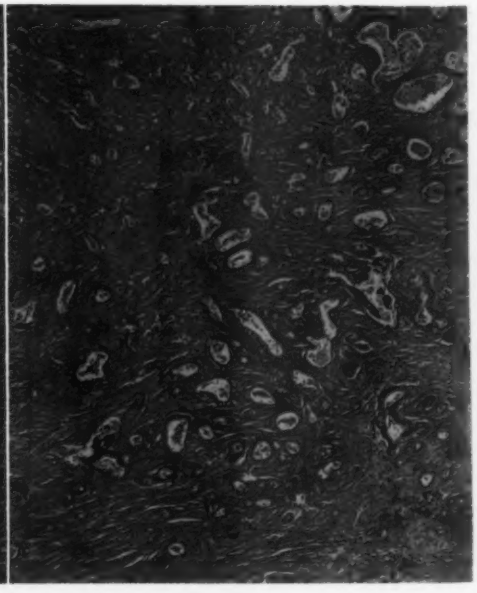

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FIG. 3. Photomicrograph of adenocarcinoma of jejunum showing junction with normal mucosa.

FIG. 4. Photomicrograph of section of tumor nodule in mesentery.

Grossly, the specimen was a segment from the small bowel which showed a carcinoma measuring 17 to 22 mm. in width and completely encircling the bowel. (Fig. 2.) The tumor had perforated the wall and presented on the external surface at two points. There was one nodule in the mesentery. Microscopic sections showed an adenocarcinoma which was of a

mucous-secretory type and was a grade three. (Fig. 3.) It had destroyed the muscle wall. The nodule in the mesentery was made up of tumor. (Fig. 4.) A diagnosis of adenocarcinoma, grade three, of the jejunum was reached.

The patient's immediate convalescence was uneventful. Wangensteen and Wild tubes functioned well. On the fourth postoperative day the patient's condition rapidly became critical, with a sudden onset of dyspnea, cyanosis and circulatory collapse. Blood pressure was unobtainable and numerous moist rales were heard over the lung fields posteriorly. Electrocardiographic examination six hours later showed markedly low voltage in all leads. No positive evidence of intra-abdominal complications could be elicited. In view of the differences in the pre- and postoperative electrocardiographic records coronary occlusion was considered the most probable diagnosis but pulmonary embolism could not be excluded. Routine supportive therapy and oxygen were given but the patient expired the following day.

Autopsy was performed and revealed the following: generalized fibrinopurulent peritonitis; slough of portion of suture line; numerous small gross hemorrhages into the mesentery supplying the jejunum; one infarct 3 inches in diameter in the right lung; two similar infarcts in the left lung and moderate atherosclerotic narrowing of coronary arteries without occlusion. There was no evidence of remote metastases.

SUMMARY

A case is presented of primary carcinoma of the jejunum with its associated symptoms and objective findings, including roentgen examination. The primary nature of the tumor was established by subsequent autopsy. The literature is briefly reviewed.

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EMBOLIC METASTASIS TO THE INFERIOR VENA CAVA

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METASTASIS from cancer of the large bowel to practically every organ and tissue of the human body has been reported.[1–4] However, implantation in certain sites is still sufficiently rare to excite interest and comment. This is especially true of the vena cava. In a series of 334 postmortem examinations at the Mayo Clinic[4] on patients with cancer primary in the colon there was an incidence of 0.6 per cent with metastasis to the inferior vena cava. The exact site of the primary lesion in these two cases was not given. Also, during the past decade 945 autopsies on patients with distant metastasis from cancer of the rectum and sigmoid have been reported from other clinics[1–3] without mention of a single instance of implantation in the vena cava.

In view of the rarity of its occurrence, therefore, the following case report of embolic metastasis to the inferior vena cava from a primary Grade III colloid adenocarcinoma of the rectosigmoid is presented.

CASE REPORT

Mrs. E. L. S., age sixty-five, was admitted to Mount Vernon Hospital on June 23, 1946, complaining chiefly of pain in her left knee for three weeks following a minor injury. Further questioning elicited a history of intermittent, dull, low back pain radiating to the left lower abdomen and groin for eight months (relieved by strapping and physiotherapy), 15 pounds weight loss during the same period, loss of appetite and chronic constipation. There had been no bloody or tarry stools. Her general health had been excellent until onset of the present illness. There was no familial history of cancer.

Physical examination revealed a well developed and well nourished white woman who showed moderate weight loss. Her temperature via rectum was 99.4°F., pulse 100, respirations 18 and blood pressure 158/80. Her heart, lungs and abdomen were negative. On pelvic examination a slightly tender, indefinite mass was felt in the midline behind the fundus. There was slight tenderness on deep pressure over the lumbar spine. The reflexes were normal and the extremities were negative. There was no apparent limitation of motion in the spine and straight leg raising was performed bilaterally without difficulty.

The laboratory findings were as follows, namely, hemoglobin 84 (12.25 gm.), red blood cells 4.6 million, white blood cells 9,900, polymorphonuclears 77, lymphocytes 21, eosinophiles 1 and monocytes 1. The urine showed a very faint trace of albumin. The blood urea nitrogen was 19 mg. A barium enema revealed an annular infiltrating lesion of the rectosigmoid without significant obstruction. Films of the spine and chest showed destruction and collapse of L 3 vertebra and mottled infiltrating lesions scattered through both lung fields.

Regardless of the presence of metastasis it was believed that extirpation of the primary lesion, if possible, should be performed and on July 3, 1946, an exploratory laparotomy was performed. No gross metastases were found in the liver or elsewhere but there were a few hard nodes in the sigmoid mesentery. Approximately 12 cm. of the rectosigmoid, including the aforementioned nodes, were resected and a primary end-to-end anastomosis was effected. A rectal tube was passed proximally beyond the anastomosis. The patient did well for two weeks following operation but then signs of leakage developed at the site of resection. On July 21, 1946, a small abscess pocket was drained per rectum with temporary improvement but the patient's general condition was poor and she expired on July 31, 1946.

In the pathologist's report on the resected specimen the following could be noted:

Gross examination showed the specimen submitted consisted of a segment of large bowel which measured 12 cm. in length and 5 cm. in its greatest thickness. A large, neoplastic area involving the mucosa was seen beginning 1 cm. from one end of the specimen and extending for 5 cm. of the length of the specimen. Inspec-

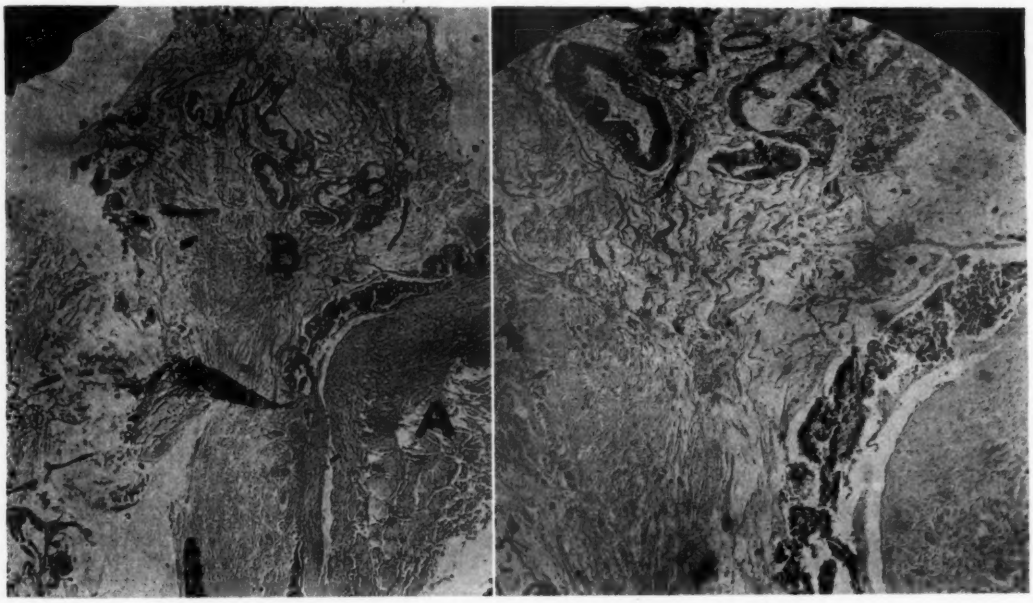

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FIG. 1. Low power view of segment of the inferior vena cava (A) demonstrating the adherent tumor thrombus (B).
FIG. 2. Higher power view of the carcinomatous thrombus.

tion of the mesentery revealed several lymph nodes.

Microscopic examination revealed diffuse invasion of the wall of the bowel by many large and small irregular acini of atypical appearance. Areas of colloid formation were seen. The epithelial cells were hyperchromatic and pleomorphic. Many mitoses were seen. Sections of the regional lymph nodes revealed nothing remarkable.

The diagnosis was colloid adenocarcinoma, Grade III, normal regional lymph nodes.

In the pathologist's report of autopsy findings we found the following:

Gross examination revealed that when the abdomen was opened, about 300 cc. of cloudy, thin fluid was noted between the loops of bowel and above the right lobe of the liver. The transverse colon was moderately distended. The operative area in the lower abdomen was completely walled off from the upper abdomen by adhesions of the greater omentum to the anterior abdominal wall. A small abscess cavity was found at the site of the colonic anastomosis in the region of the rectosigmoid. It was well walled off and no evidence of obstruction existed. The remainder of the gastrointestinal tract was essentially negative.

Adherent to the posterior wall of the inferior vena cava, about 1 inch below the entrance of the renal veins, there was a yellowish gray thrombus measuring 1.5 by 1 by 1 cm. On section it had the character of neoplastic tissue. (Fig. 1.)

There were metastases to both lungs and to the body of the third lumbar vertebra. The other organs showed no remarkable gross changes.

Microscopically, the thrombus in the inferior vena cava was extensively necrotic and adherent to the intima. High power magnification revealed nests of atypical epithelium characteristic of adenocarcinoma as well as calcification. (Fig. 2.)

The gross appearance of metastases to the lungs and the third lumbar vertebra was confirmed by microscopic examination.

SUMMARY

A case of blood borne embolic metastasis to the inferior vena cava from an adenocarcinoma of the rectosigmoid has been presented.

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New Instruments

SIMPLE DEVICE FOR AMBULATORY PATIENTS WEARING T TUBES*

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ATTENTION to seemingly unimportant details often adds much to the comfort of a patient. The wearing of a T tube in the common bile duct for weeks or months, necessitating perhaps drainage of the tube each night while the patient goes about his normal activities in the daytime, can be simplified by the syringe-needle principle. Experience with sticky and soiled rubber, cumbersome glass connectors, too heavy tubing and metal clamps has prompted the use of the following device:

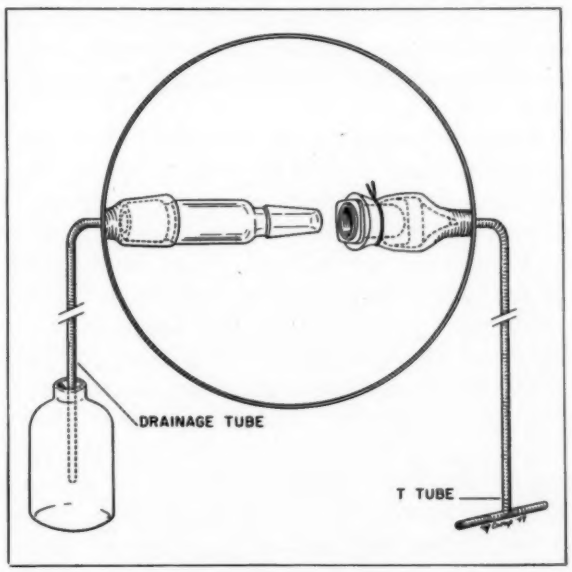

FIG. 1.

A common syringe adaptor is placed within the end of the T tube; or if the T tube should be a small one, the shaft of an old No. 15 needle can be broken from the hub and the hub inserted into the tube, a lighter and more satisfactory connection. In either case the connector is fixed in place by several turns of a piece of silk. Most of the commercial intravenous sets are now disposable and consist of a very light 3-foot length of small bore plastic tubing fitted with a tip of light metal to accommodate the needle.† Such a tube is simply fitted into the connector on the T tube when drainage is indicated, the other end being placed in a drainage bottle. When disconnected the T tube is folded over and held closed by means of a rubber band. Figure 1 illustrates the principle.

Several advantages are apparent. During hospitalization irrigations of the T tube and cholangiograms are facilitated since the hub fits any syringe. The disposable tubing is very light, readily available and can be replaced at any time. The metal connections allow fixation of this portion of the device to the dressing or skin with no danger of breakage, or discomfort due to the usual long glass connectors.

† The tube illustrated in Figure 1 is from an Abbott "Venopak."

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A HEADLESS SELF-DRILLING SCREW

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THE headless screw described herein is designed to drill, tap and insert in one operation a firmly holding screw for the reduction of bone fractures. Since the cortex of live bone is a dense, hard and tough tissue, careful attention must be paid to the various cutting angles and clearances involved. Figure 1 shows the principles of design of this headless bone screw and drill.

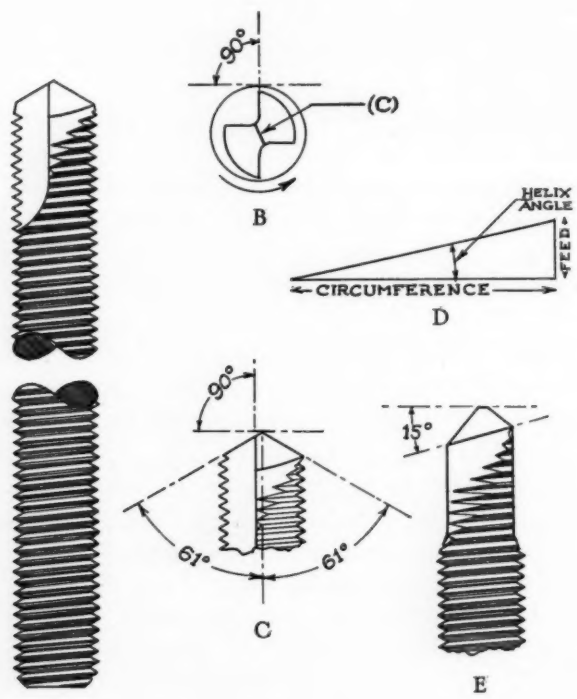

FIG. 1. A, front view of screw showing general construction; B, detail of point showing web, chisel point, eccentric relief and rake angle of flutes; C, detail of point showing point angle and rake angle of cutting edge; D, diagram showing determination of minimum clearance angle at periphery of cutting lip; E, detail of lip clearance angle.

The thread employed is of the 60-degree sharp V type, with a minimum of rounding at the root and crest. Because of the drilling problems to be described the thread used should not be coarser than thirty-two to the inch, which gives a total engagement in the bone cortex of about 0.040 inch. Finer threads, up to forty to the inch, should be used only on the smaller diameter screws where they are necessary to avoid excessive weakening of the screw.

Instead of having separate sections for the operations of drilling and tapping—a short drill section, a tap section and a screw section—these are combined into one. The threaded portion, except for a slight chamfer which is eccentrically relieved, runs all the way out to the periphery of the cutting lip so that the fluted portion acts as a drill, as a tap to cut the threads and as a screw to hold the bone. Only the conical drill-end itself does not engage in the holding process. In the largest screw used this conical drill end is less than $\frac{1}{16}$ inch long.

As can be seen in Figure 1B the web is made as thin as possible without excessively weakening the point. In actual practice a chisel point (C) a little more than $\frac{1}{32}$ inch long has been used and found satisfactory. Since the flutes are cut radially as shown, the rake angle is 0 degrees.

Figures 1C and 1E show the tapering eccentric relief which is ground for a length of from five to ten threads from the point in order that the drill and tap may cut freely. Since the flutes are straight and parallel to the axis, the rake angle of the lip is 0 degrees as shown in Figure 1C.

Figure 1C also shows the angle of the point at the cutting edge of the lip. Although this is not highly critical, an included angle of 122 degrees as shown has been found best for the drilling of live bone. The feed of the drill point is determined by the pitch of the thread used. It is essential that the drill point cuts at the same rate as the screw tends to advance.

Figure 1D is a diagram showing the determination of the angle of the helix following by the periphery of the cutting lip during the drilling operation. Assuming a thread of thirty-two to the inch, the smaller the circumference of the screw the greater the angle of the helix involved, and thus the greater the lip clearance angle needed.

Figure 1E shows a point with a lip clearance angle of 15 degrees which has been found satis-

factory for screws with diameters of from 0.164 to 0.190, provided the thread used is not coarser than thirty-two to the inch.

In use this headless screw and drill is turned into the already repositioned and clamped bone, traversing the fracture line until the opposite cortex has been pierced. Since live bone grips a thread of this form very tightly, in a large number of cases no nut or plate is used. The screw is cut close to the bone on the exposed side leaving no protrusion. These screws adequately hold the fracture securely. The number of screws required as well as their position and angle of insertion depends upon the judgment of the operator. Usually two or three screws are sufficient. In the case of transverse fractures these screws, with the addition of nuts or washers, can also be used with plates, eliminating the separate drilling operation and its attendant evils. Because of its headless feature one length of screw suffices for all operations. The excess, after the opposite cortex has been penetrated, is cut off and discarded, either with or without the preliminary attachment of plate, washer or nut.

SUMMARY

A new self-drilling, self-tapping screw is presented which differs from others previously described in that it is headless and its threads extend to the drill point. These features offer the advantage of indeterminate length, allowing for accurate application irrespective of the size or diameter of the bone. In use the drill point pierces the exit cortex and the threads immediately following engage the cortex.

The screw has been successfully used in twenty-five cases[1] of varying types of fractures.

Acknowledgment: Appreciation is expressed to Messrs. Barny and Street for technical assistance.

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AN AID IN THE FORMATION OF TANTALUM CRANIAL PROSTHESES

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THE use of tantalum in the repair of cranial defects following traumatic or surgical loss of bony substance has received considerable attention and is now becoming a generally recognized procedure.[1] Although it may be necessary occasionally to preform the plate, it has been pointed out that in most instances an excellent cosmetic result can be obtained by forming the prosthesis at the time of operation. This not only has simplified the formation of the plate but also has the added advantage of allowing immediate repair of the bone defect at the time of the primary operation. The advantage of immediate cranioplasty is of more than cosmetic significance. As has been noted[2] early restoration of the normal rigid and convex character of the cranial vault not only prevents the formation of scalp-dura-brain adhesions and scar but also prevents or minimizes secondary traction effects due to the normal pulsation of the brain.

FIG. 1. Photograph of both portions of the steel anvil used to form tantalum plates at time of operation.

MacKay and Russell[3] have shown that a basic tantalum cranioprosthesis can be preformed to fit almost any portion of the calvarium, and from this any desired plate can be removed. However, experience has shown that even large and fully contoured plates can be formed rapidly and accurately at the time of operation provided an adequate anvil is available. This article described a type of anvil which has been of great value since it has both a concave and a convex surface against which the tantalum plate may be hammered into the correct form. (Fig. 1.)

The basic part of the anvil consists of a steel block with a circular concave hollow which is 5 inches in diameter and 2 inches deep in the central portion. The second portion consists of a spheroidal segment with a 4⅞ inch base diameter and 1⅞ inch height. This segment is made with a circular base plate conforming to the outside shape of the first part of the anvil. (Fig. 2.) Both portions have a threaded opening on one side into which a handle can be fastened for easier manipulation. The progressive degree of curvature of both the concave and convex surfaces allows for the formation of almost any prosthesis to correspond to that of the calvarium.

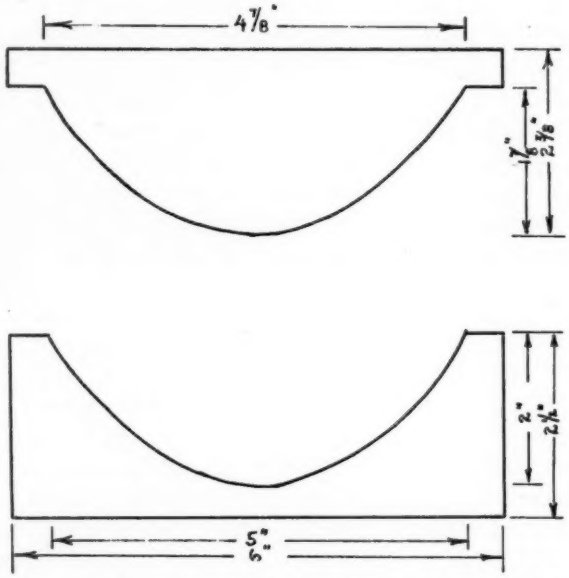

FIG. 2. Cross sectional drawing giving essential dimensions of steel anvil.

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A Tribute

DR. RUDOLPH MATAS

A BELOVED man of medicine and one of the world's truly great men is Dr. Rudolph Matas of New Orleans, Louisiana, who celebrated his ninetieth year this September.

No other American surgeon has had so many honors heaped on him both at home and abroad. The honors awarded Dr. Matas rate paragraph after paragraph in *Who's Who*. He has headed every important American medical surgical society and was President of the International Society of Surgery. Universities have awarded him honorary degrees. Nations have singled him out for fellowships and doctorates. He has been awarded the Henry Bigelow Medal of the Boston Surgical Society, the world's highest award for general surgery, and the award for vascular surgery is named in his honor.

Born of Spanish parents at Bonnet Carre on September 12, 1860, Dr. Matas returned to Spain with his parents at the age of two. By the time he was eight years old he had lived in Barcelona and Paris and had already become a linguist. He returned to America in 1868 and lived in Brownsville, Texas. Dr. Matas studied in the literary department at Soule College and attended schools in Matamoros, Mexico, and San Juan.

His long and famous medical career began when he entered Tulane University, then known as the University of Louisiana, in 1877 and earned the degree in medicine before his twentieth birthday. While still a medical student he went to Havana with a yellow fever study commission and later worked in many plague areas to combat the disease in the United States. He is especially noted for his fine work in the fight to cleanse New Orleans of the mosquito that spread the fever.

In 1886 Dr. Matas was appointed demonstrator of anatomy at Tulane University. In 1888, at the age of twenty-eight, he performed for the first time the "Matas operation" on tumorous blood vessels. In the annals of medicine this stands out as his major achievement.

His work in other fields must not be overlooked, however. Dr. Matas invented and developed splints for fractures, made discoveries in the advancement and use of local anesthetics, pioneered in chest surgery and developed a positive pressure drum to prevent lungs from deflating. Without this latter accomplishment the later miracles of modern chest and heart surgery would be impossible.

As Professor of Surgery at Tulane University, a position which he held until his sixty-seventh year, Dr. Matas' recommendations to facilitate the teaching of medicine were noteworthy. He urged the use of movies as a visual aid in teaching. He stressed also the importance of immediate attention to the injured which finally led to the establishing in Tulane's curriculum a course that was later to be known as First Aid.

He was chief surgeon at Touro Infirmary in New Orleans and retired from this post in 1935. During the long years of his practice Dr. Matas charged modest fees, but he succeeded in convincing many of his wealthy patients to pass on substantial portions of their fortunes to medical advancements.

After seven decades in medicine he put aside his scalpel and retired from active surgery in 1940, but has continued studying, writing and consulting. Convinced that no man can be a good doctor unless he is well informed, Dr. Matas spends most of his money for books and journals and is known to work in his library until three o'clock in the morning. He is now writing a five-volume history of medicine in Louisiana but is quite frank in admitting that he does not expect to live the ten more years it will take to complete this medical history.

At ninety Rudolph Matas is a short man of sturdy stature with a white mustache and goatee. He is quick of movement, a tireless conversationalist, quick to laugh and is admired by people who know him for his congeniality and approachability.

From the philosophical heights of his ninety years, his presidencies, his honorary memberships, his medals and citations, his professorships and his orders, this great old surgeon credits his long life to two things: (1) good heredity and (2) knowing when to quit.

[We received the foregoing from P. J. Rinderle, Editor, Bureau of New Orleans News, and gladly hasten to publish it. When we assumed the editorship of The American Journal of Surgery nearly twenty-three years ago, Dr. Matas had been on the Editorial Board many years. All this time he has given generously of his services and proved himself a valuable and true friend. In our opinion he is one of the great surgeons, if not the greatest, of the past six decades. We sincerely wish him many more years of work, health and contentment.

EDITOR]